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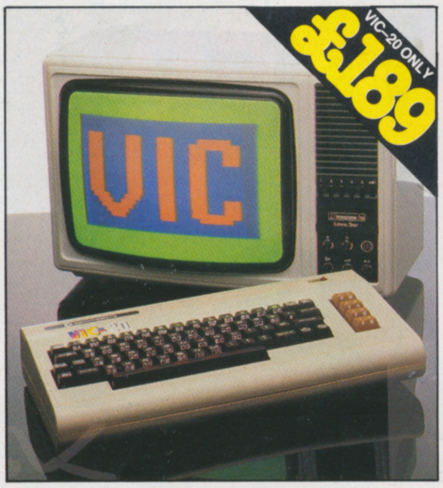

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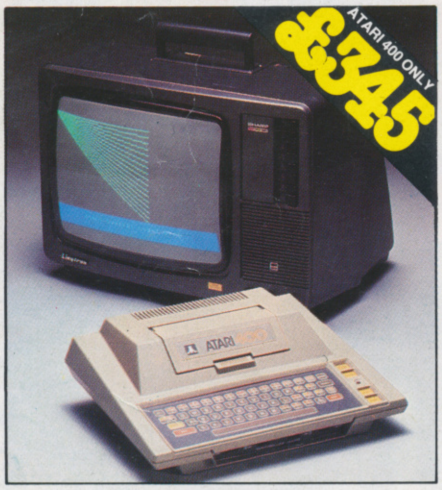

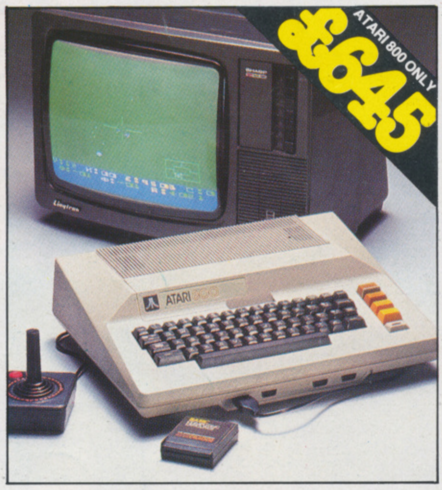

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COMPUTER & VIDEO GAMES

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NEXT MONTH

LEISURE is a much bigger pastime in the U.S. and the games which are successful over there tend to cross the Atlantic six-12 months later. In our next issue we report back on the latest toys and games to find their way onto the American scene.

HARDCORE changes its format next issue when we take an in-depth look at the Acorn Atom. With an exhaustive list of the companies which supply games software and peripherals for it. All you ever wanted to know about the Atom but didn't know who to ask, next month.

BOLDLY go where no man has gone before in our Startrek game next month. Startrek 111.4 offers a few extra features, on top of the usual Klingons, starbases and stars. Octadraw, Entomb and Yahtzee also feature in our games listing section.

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NEXT ISSUE ON SALE FEBRUARY 16th

Isn't it about time you took out a subscription to Computer and Video Games?

Whether your idea of a worthwhile challenge is saving Europe in a war game, sharpening your chess strategy, or landing a 747 on a dark night, computers can make it possible.

Computer games are reaching new levels of exhilaration, realism and imagination. They can already test your intellect and dexterity to its limits, in the not-too-distant future there will be no limits to the excitement they can simulate.

Computer & Video Games is the monthly magazine designed to make sure you get the most out of your computer.

It brings the best entertainment out of all types of computer, from personal Sinclairs, Ataris, Tandys, VICs, Apples and PETs to viewdata and arcade machines.

Every issue's packed with pages of games programs for you to key-in to your machine. And you don't have to be a computer expert. Each month there's reviews of new computer and video games, regular pages on chess, adventure and kit-building.

Learn to program or improve your programming skills with our regular features on the art and find out how to add graphics and sounds to the games you invent yourself. There's also regular brain-teasers, prizes plus hints on how to beat arcade video machines.

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MAILBAG

Do you have any views or comments on Computer & Video Games? If so we would love to hear from you. We will also do our best to find answers to any queries you may have or solve problems you might be experiencing with your computer. Please drop us a line at: Computer & Video Games, EMAP, Durrant House, 8 Herbal Hill, London EC1R 5JB. If you have already sent in a letter which has not yet been published, please bear with us as we have been overwhelmed by mail after our early issues. We will get around to your query as soon as possible.

BBC GAMES

Dear Sir,
I am about to buy a BBC Microcomputer (ANB 01) and I would be pleased if you could let me have sources of directly (or readily adaptable) available games software suitable for 32K RAM.
Colin Lindsay
Chorley
Lancs

Editor's reply: At the moment the only firm known to be producing games software for the BBC Microcomputer is Acorn, the firm making the hardware.
The latest word is that Acorn is in the process of converting some of the games currently on its books to run on the BBC machine, but these are not expected to be readily available until March at the very earliest. I'm afraid you will just have to sit tight, or get to grips with programming and work on some of your own games Colin. Good luck.

PREMIER'S NO. 1 FAN

Dear Sir,
I was surprised to read your comments on the Premier Publications software, Ship of The Line, page 83, issue 2 of your (or is it my) magazine.

I cannot speak personally of this game or any other ZX81 software as I own a U.K. 101, but I can tell you of the service offered by Premier.

To date I have brought five games, up-rated to the excellent monitor, "Cegman", added the new Basic ROM, "Basic 5", and have joined the "OS1/U.K. User Group", all thanks to Premier. I also receive a free newsletter which, apart from describing the latest additions to the range of games, ROMs and hardware, also offers hints and tips on how to expand and how to get the best from my machine. I am also comforted to know that if my computer decided to "Shuffle off this mortal coil", then Premier offers a computer repair system. If I ever become lost within the ROMs, RAMs, address buses, clock pulses or software listings, then a quick phone call, during office hours, or the use of the customer phone-in service will put me on the right track quickly and efficiently.

So, if on the very rare occasion that one of Premier's products fails to work correctly, then simply contact Premier. You will find them the most helpful and friendly people and easily Britain's, if not the World's, best software company, without another company nearing the standard of their produce or service.
Stephen Wood
Sth. Croydon,
Surrey

Editor's reply: We had suspected that this may have been an isolated case, Stephen, but felt there was no excuse for sending out a tape which has people actually talking on it. The author of Ship of the Line has since sent us another copy of the game and we look forward to giving it another try in the near future.

DODGEMS DODGE

Dear Sir,
Modifications to allow your *November Acorn Atom Dodgems* program to run without floating point ROM:

A) 11125: remove "COLOUR 2;"
11250: remove "COLOUR 1;"

B) 20, 40, 60, 80: in each alter "S = S + SGN (T-S);" to GOSj; S=S+K; and add

```
30000j K=T−S; IFK=0
R R
30010 IFK>0 K=1;R
30020K=−1;R
```

C) During debugging, remove end of line 10000 from "?16= . . ." (Inclusive)

Tom Boyd
Holmbury St. Mary,
Dorking, Surrey.

P.S. D) 11125 should be CLEAR Z, not 3 — Congratulations on an otherwise high standard of bug-free code!

Dodgems author John Dyson replies: Thankyou for your modifications for running Dodgems on a machine without the floating point ROM.

NOVEMBER CAME EARLY

Dear Sir,
My main question is if I could somehow get a copy of what I think must be your November issue. That's the one I first saw, a friend had it.

I got down to the local newsagents as fast as possible, but they already had the December issue, and thus had already sent back the others. After searching all over I found the situation was the same all over. So I tried convincing my friend to sell me his copy, but no dice.

So as a last resort I'm contacting you. Since I don't know how much it would cost for you to mail me a copy, I couldn't send the money along. But if you can save me one and write and say so and how much, I would happily send the money.

I love your magazine and think it will do very well. I only have one suggestion. Although you can't take the suggestion of B. A. Moore (December Mailbag), maybe you could put comments beside the not-so-obvious parts of the programs to explain exactly what they do. Then people could translate the games into whatever language they are working in. That way only one set of comments would be needed, and in only one language, English! I hope you can get me that copy.
Colin Garrett
Northcourt Avenue,
Reading.

Editor's reply: We have had several enquiries about back issues. These can be obtained from EMAP National Publications Limited, Computer & Video Games Circulation Department, Reader Service, Bretton Court, Bretton, Peterborough. PE3 8DZ.

On your other point, Colin, we are picking out a couple of programs each issue and giving a rundown on the variables and which parts of the program do what.

MAILBAG

Many of you may have tried to contact advertisers through our reader enquiry service. Unfortunately, due to the massive reader response we have not been able to process all of these. If you filled in a card and still have not heard from our advertisers, we would suggest you contact the company concerned directly. We are sorry for any inconvenience but nobody could have predicted the phenomenal response we received on our first two issues.

SARGON FOR THE SHARP?

Dear Sir,
I have a Sharp MZ-80K 48K computer and am interested in obtaining a chess program for it ideally Sargon II. I have been unable to find this program for the Sharp and wondered if you know of anyone producing it for my machine.

Alternatively could you let me know how the chess program that Newbear Ltd, Newbury, Berks, have compares with Sargon II.

I enjoyed your first magazine, although I haven't managed to get "Hangman" working yet and look forward to your next.

J Hunter,
Hove Edge,
Brighouse,
W. Yorks.

Editor's reply: I'm sorry to have to report that chess games for the Sharp MZ-80K are few and far between. There is no Sargon II available for the machine although Sharpsoft has written a version but the copyright is owned by Hayden Books who are unwilling for Sharpsoft to market it.

Sharpsoft does market its own chess game but it is only for beginners. Experienced players would soon find the game unchallenging.

Newbear's chess game is not as demanding as Sargon II either, and although it is not directly aimed at beginners the bulk of sales is made up of inexperienced players and children.

ATARI'S FAME

Dear Sir,
Congratulations on your first issue of *Computer & Video Games* which certainly fits more into my own microcomputer aspirations than any of the other more business oriented publications around.

I am a keen computer games player, and writer, although I only presently own a Sinclair ZX80. I am looking around to buy myself a new computer and have heard that the Atari duo have by far the best graphics facilities — although I have never seen either of these machines in action.

Could you please tell me if the Atari 400 and 800 graphics are more impressive than other machines in a similar price range — and if so why aren't other manufacturers using a similar system?

Joseph Sandridge,
Chells,
Stevenage,
Herts.

Editor's reply: The Atari computers certainly have good graphics characters, and the games ROM-packs that plug into the system use these to their best advantage. However, the highest resolution of the Atari system is 320 × 192 points — or picture elements (pixels). This is quite acceptable for most users. The Atari computers cost around £345 and £645 respectively.

Other manufacturers do use high resolution graphics — in up to 16 colours. Notable among Atari's competitors are DAI with the PC.1' costing £595. This has more memory than the Atari 800 — 48K compared to 16K — and has even more pixels — 335 × 255. Unfortunately it has only a small amount of very good software. Texas Instruments have recently reduced the price of the T1 99/4a to around £300. This has a similar specification to the Atari 800 — and has the capability of superior graphics because of the use of a 16 bit processor, compared to most other systems' 8 bit.

As you can see I have only scratched the surface and more systems are coming onto the market all the time. The VIC-20 and BBC Microcomputer will also give the Atari 400 a run for its money — and both are cheaper. You can see that it's more difficult than you first thought.

Get friendly with your local dealer, and find out what support he'll give you. Compare dealers, if you have a choice, and then look at software availability and cost. Only you can evaluate all these factors yourself.

MASTERING THE MACHINE

Dear Sir,
Thank you for an interesting new magazine, it seems to fit the gap between the semi-professional format of the home computer user and the "toy" market.

I have an Acetronic MPU 1000 Video Games Centre with a variety of preprogrammed cartridges.

The one cartridge that is programmable is the Hobby Module but, apart from the few programs they supply in their instruction manual, I cannot seem to master the machine code that is needed to operate it, can anyone help?

The maker of the chip, a 2650 by Mullard, had produced a book by S. J. Op Het Veld entitled *Microprocessor Controlled Video Games* but is now out of print and no hope of it being reprinted so now you know why I need help.

I have solved your octagon puzzle the "old fashioned" way in about 15 minutes. If I had a proper computer I would, somehow, work out a program in order to enter your competition for the Vic-20 you are offering, I think it's great.

If any of your readers can help me find any programs for the 2650 chip, or has a copy of the book above, I would be more than grateful.

J. F. Baldock
Ashford,
Kent.

Our expert replies: concerning you problem with the Acetronic MPU 1000 Video Games Centre. You rightly state that the chip is a 2650 from Signetics, made by Mullard. This is a general purpose microprocessor with a 75 code instruction set.

I am afraid I can find no information on the book *Microprocessor Controlled Video Games* by S. J. Op Het Veld and can only suggest you try the public library. If the book was on sale in this country then the Central Library will have a copy.

On the other hand, Mullard produce a data sheet and Signetics a complete family booklet, both available from Mullard at Torrington Place in London. Both include the complete instruction set but you may have to consult a separate book to understand how to use the different addressing modes.

MOLE GOES DOWN

Dear Sir,
I have entered your Mole program and it is a very enjoyable game but I cannot get a score and feel there is a mistake in line 25 which I cannot enter successfully.

Can you help?

I have entered the other two Sinclair games in your January issue and found them most enjoyable.

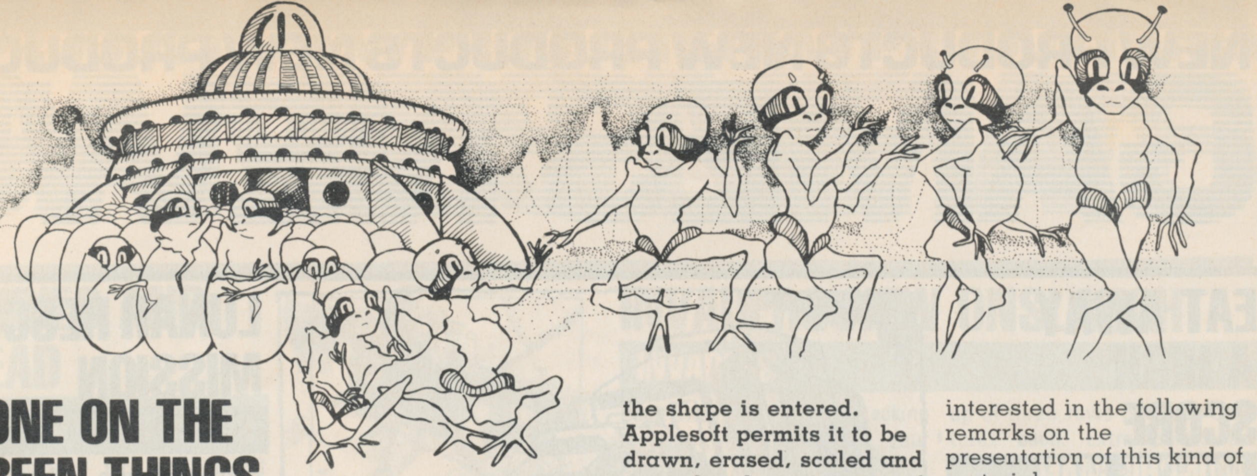
Congratulations on an extremely impressive magazine.

D. Johnson,
Croydon, Surrey

Editor's reply: A bug slipped into this program which had to be typeset. Line 25 should read:

```
25 LET R = PEEK (PEEK
16398+256* PEEK 16399)
```

We apologise for the mistake and hope you enjoy the game.



GONE ON THE GREEN THINGS

Dear Sir,
Many thanks for a wonderfully different magazine. I was particularly impressed with the way you have tried to present the games listings in an interesting and imaginative way. The Bugs are a marvellous invention and almost worth a magazine on their own.

Among the other artwork, I thought the most impressive were the strange creatures which were used to illustrate the Acorn Atom's Green Things game. I look forward to seeing more work by your artistic team in the future.

David Green,
Wolvercote,
Oxford.

BOGGED DOWN IN ACTION

Dear Sir,
For just over a year now my friends and I have been making up a variety of arcade-style computer games on the school computer (an Apple II 48K Europlus).

The main problem with these games is that the more action, aliens and obstacles the more bogged down and slower the program gets. This causes all moving shapes to flicker something terrible.

Obviously what is needed is machine language routines, such as those used in Bill Budge's Penny Arcade where the ball does not flicker and will bounce off anything that is not black. The information to make up similar routines is sadly absent from the available Apple manuals and so I must seek your help.

At the moment the shapes for our games are stored on disc, separate from the programs and are loaded and addressed by an exec. program which is fine for me, but not for less knowledgeable people who just run the program and expect it to work.

We do have programs which will load the shapes when asked but the addressing causes interference with any inputs immediately afterwards.

Naturally the direct POKE-ing of the shape table into the Apple memory in the first issue's Nim program interested me and I would be grateful if you could tell me how the author achieved this and how shape tables can be made without all the messing around with binary numbers, plotting diagrams, vectors and hexadecimal numbers.

I think your magazine is just what the computer industry needs and I hope to contribute some of my program listings in the near future.

Neil Forsyth
Naim
Naimshire
Scotland

Garry Marshall: The high resolution shape tables, available in Applesoft, are precisely what you need. As far as "messing about with the binary numbers" is concerned, you have to do it that way, because that is the way it works. Actually, it isn't at all difficult to do, once you have got the hang of it. I don't think that you would expect to get rapid moving graphics effects without expending a little effort.

The graphics effects can be really spectacular: once the shape is entered. Applesoft permits it to be drawn, erased, scaled and rotated with a minimum of programming effort. Watch the Graphics page for further details.

A SOFTWARE SENSATION

Dear Sir,
To my mind, people are attracted to arcade games subconsciously, for they often get out far more than they put into these computers.

Take Atari's Battlezone. It caught my eye in a fish'n'chip shop because of the XY monitor with vector scans, and the prodigious amount of maths the computer gets through in real time. In case you haven't met it, it's a fighting tank simulator in which you drive around a valley dodging missiles and rocks. Everything is portrayed in full perspective, right down to the missiles flying longer to distant targets.

A kind man let me mend one. There's a 6502 riding a 12K program, plus four custom bit-slice chips doing 16-bit trigonometry, among the 150 other support devices. She certainly puts out more than you put in. At a guess the software came out of the backdoor from NASA, Boeing and Lockhead.

Thought your readers might be interested.

Jonathan Pope
Chesterton Road,
Cambridge.

TAINTED BY TINTS

Dear Sir,
I have just copied a program for solving Rubik's Cube from your magazine, and I think you may be interested in the following remarks on the presentation of this kind of material.

I presume you wish your readers to get the programs in your magazine up and running with as little trouble as possible. A clear and accurate printing is therefore required. I know that many microcomputers are provided with poor printers, and that accuracy demands that you print by some photographic process from such output.

I am not convinced, however, that you are not adding further difficulties for your readers by the way the programs are printed. The dark grey on light grey technique of page 62 is particularly troublesome, the pictures on many of the pages are also distracting. Fortunately I did not have to contend with printing on the slant, or with a program printed over pictures, both of which occur elsewhere.

A lively pictorial presentation is of course an admirable aim, but if you want your readers to enjoy the programs you publish and buy further copies of your magazine I feel you must make copying the program more easy.

D. Bond
Kesgrove,
Ipswich.

Editor's reply: Thank you for your comments Mr Bond. We do appreciate the difficulties of keying-in programs, especially the long and complicated ones. We do take great care to ensure that when coloured tints and pictures are placed over printout, that the symbols can still be seen clearly.

If you find them a distraction I suggest you use a ruler (or, dare I suggest, a template) to keep your place in the listing. Our aim is to keep the listings both readable and presentable.

GAMES NEWS

EAT AWAY A HIGH SCORE

MUNCHIE MAN

The Munchie Man's appetite is of a kind common among readers of slimming magazines.

He digests without discomfort and travels around your Acorn Atom screen consuming dots as fast as he can. But he has enemies, four ghosts, whose aim is to put a stop to the ravenous creature by eating him up.

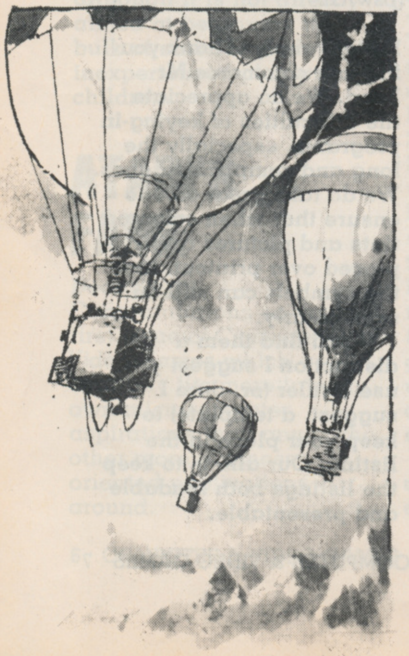
In this version of the arcade game Puckman or Mazeman, you play the part of the Munchie Man and score points for every morsel you eat.

Bonus points are accumulated by eating the evil meanies when the tables are reversed. This is achieved by gulping down one of the flashing spots in the corners of the screen, which gives you the energy to chase and eat the meanies for a few brief seconds.

Program Power are the suppliers of the game which runs on a full memory Acorn Atom and will cost £4.95 for a cassette. Perhaps it could be good aversion therapy for a slimmer.

TAKE A BALLOON TO THE TOP

THE GREAT BALLOON RACE

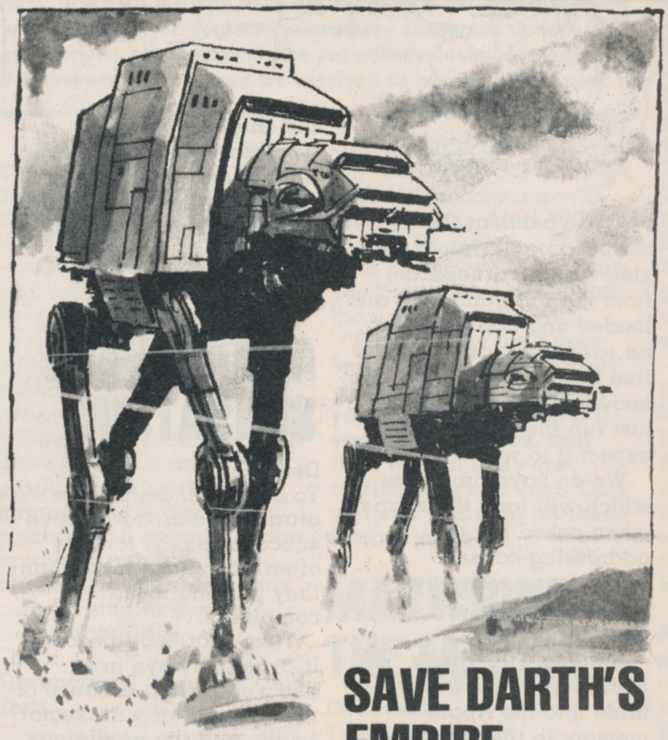


A £50 prize adds to the incentive of mastering the Great Balloon Race and notching a top score.

Manchester-based Mr Micro have put up the money for the person who can best guide a balloon around a course on the Pet or VIC-20 computers. Among the lethal hazards on the course are: flowers, trees, and a fence.

You score points for the distance you manage to guide your balloon.

The maker has come up with an ingenious idea to verify each entrant's score. Special characters flash up on the screen to represent a particular score. The race finishes on 14 October 1982 and the cassette costs £16.



SAVE DARTH'S EMPIRE

EMPIRE STRIKES BACK

Join the forces of the tyrannical Darth Vader, waging war against the rebels who dare to oppose the Empire.

In Empire Strikes Back you are given command of a squadron of Walker Tanks, which look like camels but are made of metal and are equipped with lethal laser guns.

You answer to the menacing leader Darth Vader if you lose a tank and the Empire goes down on numbers.

Your five Walker Tanks are in pursuit of the rebels and you must shoot down their aircraft, their troops and finally the rebel base itself. If you lose a tank in combat, the one taking over carries on where the other left off, so you don't have to go back to the beginning of the game and start again.

The Walker Tanks are precarious in their movement and you must be careful not to stop them when they are in an unstable position. If you do the Walker will keel over and collapse into a useless heap.

Throughout the game you can check how far away the Walker Tanks are from the rebel base and you can also spot enemy positions on your radar scanner.

Incorporated on the screen is a work cycle meter which, when completed, either generates more energy for the Walker, or carries out any repairs the tank needs.

Supplier of this game is Tandy software specialist Molimerx of Sussex. It can be yours for £10.06 (including VAT) and runs on a 16K Tandy TRS-80 Level II.

LUNAR RESCUE MISSION

SPACE RESCUE

A stranded tribe of lunar creatures in fear of their lives look to you for an escape route.

As commander of the mothership hovering over the surface of the moon, your brief in Space Rescue is to save the moonies, or pods, as they are usually known. A special landing craft carried by the mothership is under your control and struggling against the relentless onslaught of a meteorite storm.

You have to land the craft on the moon's surface and pick up five pods, at the same time blasting the rocks to smithereens. After each pod is rescued you must take him back to the mothership.

Points are scored for pod picking and meteorites destroyed.

Altogether you get four lives to play with and there are nine skill levels to try out — and sound effects too. Available now from Pet software specialists Supersoft, it runs on an 8K machine and costs £8 plus V.A.T.

A DASH OF OUTER SPACE DIPLOMACY

STARSHIP COMMAND

Combine Startrek with the wargame concept, add a dash of Diplomacy and you'll end up with Starship Command.

The game is set in a spacecraft which patrols the galaxy, seeking out enemy spacecraft and keeping your allies on the right side.

In front of you is a three dimensional view of the galaxy divided up into quadrants. You must shoot down enemy ships while avoiding their fire.

But you are also in contact with other planets, some of which are hostile and others friendly. Your job is to boost the morale of your supporters to stop them changing sides and going over to the enemy.

It runs on the Nascom and costs £9.95 available from Program Power of Leeds.

GAMES NEWS

BURIED AND DEAD

ALIEN

Old fashioned pick and shovel work is the only way to rid your planet of a strange new breed of alien creatures.

In Alien, the action takes place in a maze, infiltrated by leggy beings, whose aim is to hunt you down and eat you.

Your only escape is to dig holes in the labyrinths of the maze blocking the hungry creatures' way. When they fall into the holes you have dug, you must hover nearby and fill the hole in over their heads.

The aliens are surprisingly agile and in a flash they can hop out of their potential coffin and eat your man up in one fell swoop. You get points for the number of evil meanies you successfully bury, and if you wipe one frame clean of them you get the chance to have another go at a new frame.

Alien will run on a VIC-20, and makes use of the machine's high resolution graphics. It can be yours for £19.95 from Commodore dealers.

RACE AGAINST THE CLOCK

SUPER RACETRACK

Driving round a race course at top speed is a test of concentration and skill to stay on the track and take the chequered flag in Super Racetrack.

This game is a race against the clock with the object being to break lap and race records. There is plenty of variety in the course selection so if you start to anticipate the hairpin bends on one track, try another.

Steer the car around the course keeping clear of other cars and the barriers bordering both sides of the course.

At the start, the car appears on the bottom of the screen but when the race is underway, the track unrolls before you on the screen.

This Acorn Atom cartridge is reasonably priced at £4.95 from Program Power of Leeds.

A JUMBO SIZED JOB

747 FLIGHT

Passengers and crew of a 747 Jumbo Jet are in your hands on a flight to land at England's busiest airport Heathrow.

The huge aircraft is solely in your command as you fly in the pilot's hot seat through the suburbs of London. When you have located the position of two Heathrow runways you must start the descent and safely land the aircraft. Just how good a pilot you are will be revealed once you have completed the landing — as you receive points for airmanship.

Bug Byte's 747 Flight runs on an Acorn Atom and was actually written by a Jumbo Jet pilot for the Liverpool software supplier, so it earns top marks for its realism.

On the screen you are confronted with various figures representing altitude, the state of the undercarriage, a compass, the rate of climb in feet per second, the speed of the aircraft in knots and the angle of the flaps in degrees, to name but a few.

To help you on your flight, a map of Heathrow's environs has been included with the game. On it are marked the 10 stations (six of which are close to the two runways) and possible flight paths.

All 12K memory is needed to run this simulation game and it costs £8.

INVADERS NEW ONSLAUGHT

INVADERS

Blast away at a fleet of attacking creatures in defence of your home base while niftily avoiding the onslaught of laser beams.

With four protective shields to protect your ship from the raging torrent of enemy fire you manoeuvre the base to the left and right of the screen. Keep up a constant stream of shots to destroy each fleet, but don't expect to end up on the winning side.

This 16K ZX81 version of space invaders has been written in machine code to achieve high speed screen action with a fleet of invaders numbering 21 made up of three rows of seven creatures each. Extra points are gained by hitting the flying saucer at the top of the screen.

Invaders costs £4 from Bug Byte of Liverpool, which has also just brought out a new chess game for the Acorn Atom.

Bug Byte says the game's strengths lie in its graphical representation. 'It is clearer than most chess games. In some there is confusion over the black and white pieces'. It runs on a 12K Atom and comes in cassette form with instructions, costing £9.00.

WE HAVE TOUCHDOWN

SUPERLANDER

Landing a spacecraft on the craggy hazardous surface of a strange planet is no easy task and you need a steady hand at the controls.

In the first batch of games brought out by Commodore Business Machines for the VIC-20 your task is to successfully land your spaceship. There are three safe landing sites to steer the ship towards. A safe landing needs careful judgement and a steady slow approach.

You use the joysticks to control the movement of the spacecraft, guiding it upwards, downwards, to the right and to the left. An extra feature is its power thrust facility. If you want to build up speed the engines will be boosted by pushing the control joystick down.

Points are awarded depending on the difficulty of the site you choose to land on. Superlander is available now from Commodore dealers for £19.95.

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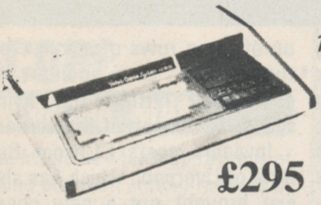

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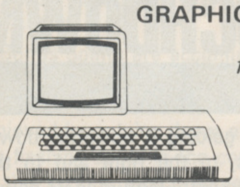

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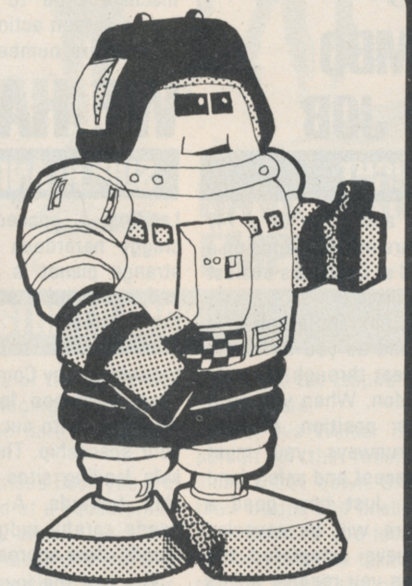

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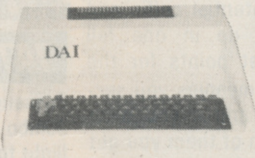

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FULFIL L'EMPEROR'S EURO-DREAM

NAPOLEON

A ravaged continent awaits the tread of your armies' boots when you try to recreate the conquests of France's 19th Century Emperor, Napoleon.

The computer organises the defence as the armies of Austria, Britain, Spain, Portugal, Russia and Prussia prepare to thwart your ambitions.

The power-hungry Emperor Napoleon, has since been hailed as "the first European."

His aim was to conquer the main European countries and be lord and master from his beloved mother country, France.

To carry out your task there are six French armies at your disposal.

The computer's armies start off from their respective countries except the British one which begins its manoeuvres from Iberia or Prussia, for ease of troop movement.

You begin the wars in June 1798, and have a time limit of 17 years imposed on you in which to complete Napoleon's ambition.

Troops take a long time to move being without fast means of transport. Weather conditions have to be taken into account when moving troops either into battle or to a new camp location. Historically Napoleon's big blunder was to make an army march on Russia in winter, when the troops were ill-equipped to cope with the conditions.

Napoleon is the appropriate name of the game. It runs on a Tandy TRS-80 in 16K and is available from Molimerx. It is only out in tape form for the price of £11.97.

VICS HELP YOU TUNE MORE EASILY

TUNESMITH

Gary Numan has brought electronic music back into vogue and now the Commodore VIC-20 is bringing similar sounds into your front room.

All you need is the latest music pack called the VIC Tunesmith and you are ready to rock. This piece of software will impress the musicians in the family and make better use of the VIC-20's sounds facility.

Study the manual that comes with the machine — there is a section listing musical notes complete with true notes, flat notes and sharps. Each has a number assigned to it which the computer understands and by typing that in via the keyboard you can write your own piece of music.

Tunesmith has a capacity for 99 note melodies and you can add in a suitable drum beat and set the speed of the tune you create. If, when you play it back, there are a few notes that make you wince don't worry — there's a special editing facility which allows you to replace the out-of-tune notes or delete them altogether.

From the VIC Centre, Tunesmith is a recent addition to the VIC software range and costs £5.95.

FLIPPER FLICKING FOR THE FAMILY

PINBALL

Invent your own pinball machine design to make the most of your flipper-flicking skills.

Pinball wizards are given their chance to improve on arcade designs in the latest cassette for the new Tandy TRS-80 Colour Computer.

A feature of the game is that you can decide how many flippers you want, where they should be positioned and how difficult or easy the finished game is and then try it out on the rest of the family.

Pinball incorporates all the features of the classic arcade game, you have to judge the best angle to hit the ball in order to make the best improvement to your score.

The game is for up to four players and you can try it out for yourself at the Which Computer? Show in a competition which offers the Colour Computer as a prize.

All the entry money collected will be donated to the Muscular Dystrophy Group and will be spent on more electronic aids for medical research. Hopes are high for piles of cash as the show organiser Clapp & Poliak is to match the sum raised on competition entry fees.

If you fancy a go the show is on from 19-22 January at Birmingham's National Exhibition Centre. The Pinball cassette costs £22.95 from your Tandy dealer.

HAZARDS ON THE FAIRWAY

GOLF

Holler "Four" if you hit a wayward shot in the most recent golf game on the computer scene.

And then cross your fingers and hope none of the crowd have wandered into the path of your ball.

This is one of the hazards in Program Power's Golf cassette, which strives towards new frontiers of fairway realism. The player is invited to take part in a championship golf tournament, he has an imposing selection of clubs to choose from and a variety of wind and ground conditions to overcome.

The wind speed changes to make the game more challenging as you have to judge the power behind your shot accordingly. It also effects the direction.

Watch out for obstacles on the course. There are awkward bunkers and clumps of trees border the fairway.

You even have rent-a-crowd on hand to bolster your confidence when you hit a good putt but be careful not to knock them out.

Golf is available for Nascom machines and has a price tag of £7.95.

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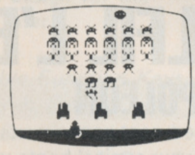

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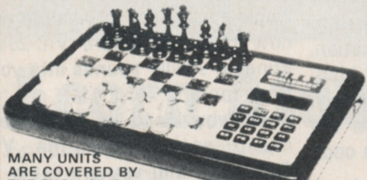

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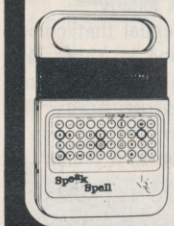

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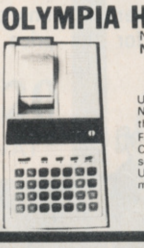

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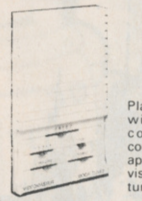

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HAND HELD GAMES

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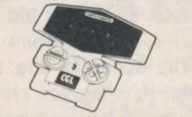
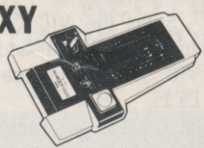


These invaders are a breed of creature hitherto unknown to man. They cannot be killed by traditional methods — they must be buried. The battle is conducted in a maze where squads of aliens chase human troops. The only way of eliminating them is by digging holes and burying them. **£23.95** inc. VAT

HAND HELD GAMES

GALAXY 1000



The 2nd generation Galaxy Invader. The invaders have re-grouped and have a seemingly endless supply of spacecraft whilst the player's arsenal is limited to just 250 missiles to be launched from 3 missile stations. You have to prevent the invaders landing or from destroying your home defences. **£19.95** inc. VAT

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The machine is easy to install and comes with full instructions. It is easily wired to your junction box with the spade connectors provided or alternatively a jack plug can be provided to plug into a jack socket. Most important, of course, is the fact that it is fully POST OFFICE APPROVED.

The price of £135 (inc. VAT) includes the machine, an extra-light remote call-in Bleeper, the microphone message tape, A/C mains adaptor. The unit is 9¾"x6"x2½" and is fully guaranteed for 12 months. The telephone can be placed directly on the unit — no additional desk space is required.

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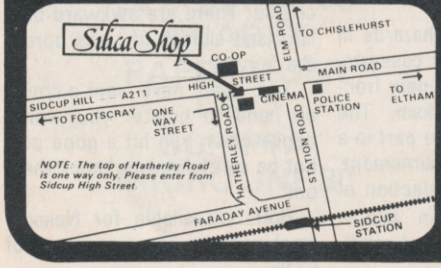

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SILICA SHOP

TEN WAYS TO USE A TEMPLATE

When we gave away a free template with our second issue, we little realised what strange perverted uses the poor defenceless pieces of plastic would be put to.

Trained only in the art of helping readers to key-in our games program listings, the templates may be hard-pressed to fulfil some of the tasks you planned for them.

Innocently we asked, "What other uses could you find for a free template?" And in implicit detail you told us! After we had thrown those out we were still left with a few bizarre suggestions and from these we picked our 10 lucky winners of Bugs T-shirts.

The winning entries are presented below and should not be read by anyone who is feeling in a delicate state. Our judge has given up trying to explain her choice of T-shirt winners and is unavailable to anyone trying to contest the decision.

"A comb for Telly Savalas," said G. D. Ray of Merley, Wimborne in Dorset and on a judge's whim he was awarded a prize. To give Mr. Ray his due, this use of a template was more sensible than most of the ideas we received.

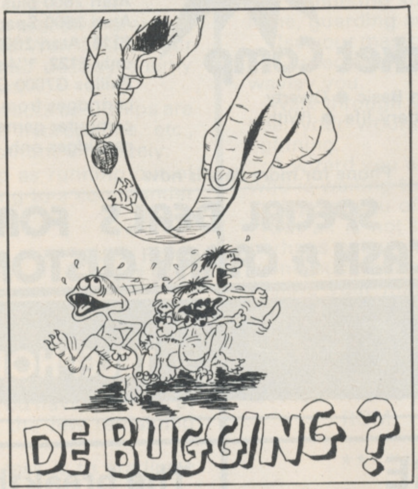
In a similar vein was Joe Hanley's suggestion that we paint a buckle on one end and use it as a fashion belt for Twiggy. But this was not topical enough for our judge, so instead she chose his second idea, that the template would make a great beer clarity tester. Puzzled? Well so were we, but Mr. Hanley elucidated with instructions: (1) place template in pint glass. (2) Read words in red letters. (3) Check against following chart: clearly visible, light ale; very vague, brown ale; impossible to see, Guinness.

Yes it really works, impressed we despatched a T-shirt to Nelson in Lancs.

The byte-ing cynicism prize went to Keith Parker of Crook, Co. Durham, whose entry read: "(1) Take template. Fold twice down length to produce a strip 1" x 2". (2) Wedge this under Sinclair 16K RAM pack . . . presto! The dreaded RAM pack wobble is cured — words fail me (sorry Uncle Clive, we all love you really.)"

Where does the cynicism come in? Well somewhere. The prize: one of our T-shirts.

Anthony Hood of Kilburn, Derbyshire gave us a rhyme: "This piece of plastic, 8" x 1"; A computer shall be stuck thereon; So when I puzzle, curse and list; I think of *C.&V.G.,* the greatest; And about the T-shirt I won; With those lovable Bugs displayed upon; Otherwise I'll probably use it to set the gap on my spark plugs."



And you thought Keats was good!

Anthony wins our Great McGonagall Poetry prize — a T-shirt. We are currently investigating claims that Anthony is a part-time Vogan spaceship captain.

No such doubt exists in the case of Kevin Etheridge — who freely admits his alien origins. Apparently the template was the answer to his dreams — mainly to get off this "dungball of a world" and back to his native planet. Kevin linked the template into his Bambletrundite Generator (mk. 4) via the automatic quark-influx module to reverse the polarity on the polychronic infundibulator and enabled him to disappear into hyperspace. Before he goes, Kevin will be hanging on for his T-shirt at Dalgety Bay, Dunfermline — he is a "large-size" alien.

D. R. Cowap of Letchworth, Herts came up with the artistic suggestion of using the template as a De-Bugging device (left).

Robin Hill came up with several suggestions, the most sensible of which, was: "Memorise this contour so you'll recognise a straight line when you see one."

He claims his address as: The Stress Office, British Aerospace, Brough, N. Humberside.

Removing the skin off old rice pudding, was the simple and practical idea put forward by Simon Hodgson of Gateshead, Tyne-and-Wear.

Just to prove there is nothing sexist about this magazine (although all the Bugs are male) our penultimate winner was Linda Evans of Burgess Hill, West Sussex.

Linda reckons the template is ideal for removing her pet parrot's little offerings from the carpet — leaving no trace! Linda assures us that the template is thoroughly wiped before being returned to keying-in duty.

And finally, Simon Young of Clapton, London E5, reckons Adam Ant uses a template to draw the make-up lines across his face.

And if you think these 10 were bad — at least they were printable. We hope we haven't given you too many ideas.

BRAINWARE ANSWERS

The answer to our January Mind Routines is that the triangular pyramid has 4, 6 and 8 layers, which gives you 20, 56 and 120 balls.

The square pyramid has 1, 5 and 7 layers which gives you 1, 55 and 140 balls.

The Nevera Crossword solution is printed right and we will publish the names of the winners next month.

This month's Brainware problems can be found on page 83.

■	1 A	2 N	A	3 P	P	4 L	E	5 A	D	6 A	Y	■
7 M	■	O	■	O	■	A	■	L	■	I	■	■
8 I	D	E	A	L	■	9 T	A	P	E	R	E	10 D
S	■	L	■	Y	■	E	■	H	■	B	■	I
S	■	■	11 A	C	O	R	N	A	T	O	M	S
I	■	■	■	H	■	■	■	N	■	M	■	A
12 N	A	13 T	U	R	A	L	N	U	M	B	E	R
G	■	E	■	O	■	■	■	M	■	■	■	R
14 P	A	S	T	M	A	15 S	T	E	R	■	■	A
E	■	T	■	A	■	E	■	R	■	16 C	■	Y
17 T	R	A	C	T	O	R	■	18 I	M	A	G	E
■	■	T	■	I	■	V	■	C	■	S	■	D
■	19 T	E	A	C	H	E	R	S	P	E	T	■

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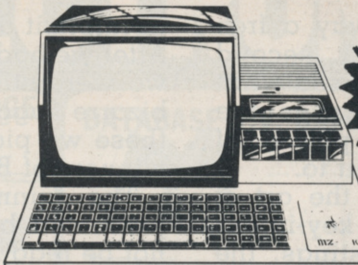

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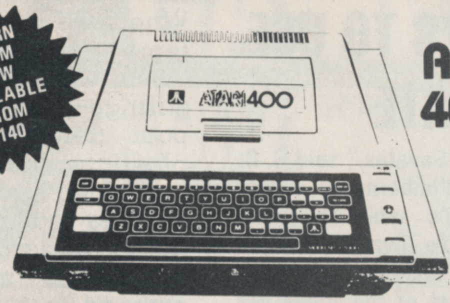

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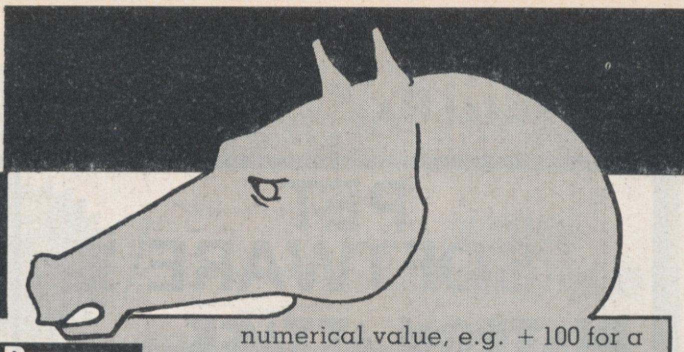
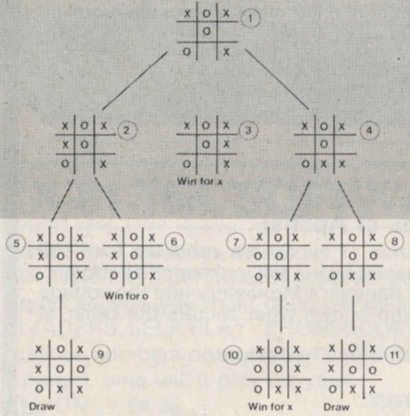
CHESS



By Max Bramer

A common myth — especially among non-players — is that expert chessplayers and chess-playing programs somehow look at every possible variation in the game.

A little analysis shows that this cannot possibly be so. In the initial starting position for chess, White has a choice of 20 moves (16 pawn moves and four knight moves). Whichever move he plays, Black has a choice of 20 replies, making a total of 20 × 20 = 400 possible combinations of one move on each side, including such unlikely combinations as 1.P-QR4, P-KR4 and 1.P-KB3, N-QR3. For subsequent moves each side is likely to have perhaps 30 alternative choices on average until quite late in the game. Thus we can reasonably estimate the number of possible ways of playing just the first *three* moves for each side by 20×20×30×30×30×30 = 324 million!



The so-called "combinatorial explosion" of variations is one of the greatest obstacles to writing almost all game-playing programs. Nevertheless, it is extremely helpful to start by thinking in terms of exhaustive analysis, stopping only when a position is a checkmate or a "defined" draw (a stalemate of inadequate material for either side to checkmate), since this leads to an elegant method of move selection, known as the *minimax algorithm*. This, in modified form, is used in virtually all programs to play chess, go, draughts and similar two-person games. It is easiest to illustrate the method by a simpler example than chess and I have taken the humble game of noughts and crosses as an example.

In the position marked 1, it is X's move and he has three choices shown as positions 2, 3 and 4. Number 3 is *terminal* and a win for X. In numbers 2 and 4 it is O's move, to positions 5, 6, 7 or 8. Position 6 is also terminal and a win for O. Following every sequence of moves through to either a win for X, a win for O, or a draw gives the complete figure which is called a *game tree*. Notice that only terminal positions 3, 6, 9, 10, 11 are labelled as a win or draw.

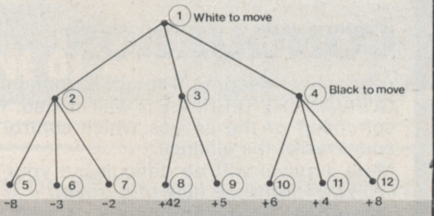
However, every other position can now be labelled (working from the bottom of the tree upwards) in a straightforward way. Numbers 5 and 8 must be draws and 7 is a win for X since there is only one legal move each time.

Now look at position 2. It is O's move and he can either move to 5, a draw, or 6 a win for O. Since it is O's move he will choose the best alternative from his own viewpoint, in this case 6. So 2 is also a win for O. In the same way 4 is a draw, since O will certainly avoid playing to 7 and losing. Finally consider position 1. Now it is X's move and the choice is between 2 (a win for O), 3 (a win for X) and 4 (a draw). He naturally will choose 3 and so the original position 1 is a win — as is obvious at a glance — with the best move being to 3.

The same method would work equally well for any size of game tree, with any number of levels, provided the players move alternately, as they do in chess.

The first step towards a solution is to extend the idea of a *score*. Instead of just win, draw or loss, every position is given a numerical value, e.g. + 100 for a large White advantage, –3 for a small Black advantage (it is convenient always to score from White's viewpoint). Of course, this is much less precise and requires a great deal of judgement to do even reasonably well (how does a weak pawn balance against a strongly centralised queen?)

Just as in the noughts and crosses example, the score of the initial position being analysed can be computed by "backing-up" values, level by level. Figure two shows an example, analysing just one move for each side. Note that all scores are taken from *White's* point of view, so negative scores are favourable to Black.



The values –8, –3 etc. are scores assigned to the final position, i.e. those where analysis stops. In positions 2, 3 and 4 it is Black's move. In 2, he will play to 5 since a value of –8 is better than –3 or –2 from his viewpoint. Thus 2 has a score of –8 and similarly 3 and 4 should score +5 and –4, respectively, with Black always playing to minimise the score of the resulting position. From White's viewpoint, in position 1, it is best to maximise the score he can obtain, thus he chooses to play to 3, value +5, not 2, value –8 or 4, value –4. The same alternation of White maximising and Black minimising would again work with any number of levels and, not surprisingly, is called the *minimax algorithm*. Using the minimax algorithm does not solve the combinatorial explosion, since even looking two or three moves ahead for each side gives a vast number of positions, but it is an invaluable start.

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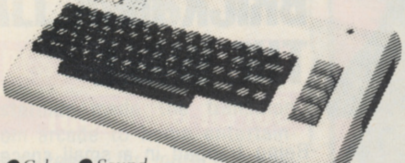

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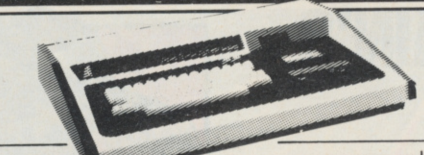

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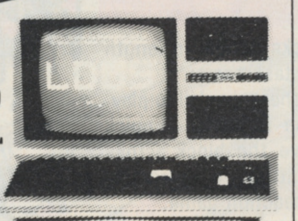

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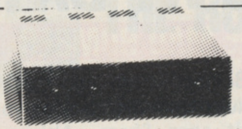

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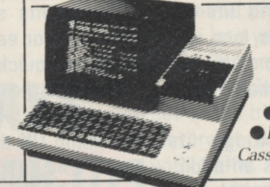

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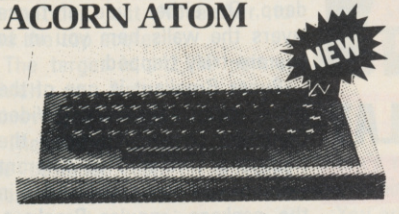

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This Activision cartridge fits the Atari VCS and has an addictive quality making it hard to put down. At the bottom of the screen are three blocks which you can move about with your paddle controllers.

Kaboom moves erratically from one side of the screen to the other and drops a series of bombs with lighted fuses which you catch with your block.

At first the bomber moves slowly so there's no problem catching the bombs but as the game progresses Kaboom really does go mad making it a hard job for you to tackle.

There are two options to vary the game. On the first the blocks are piled three high, on the second the blocks double in length making your task easier.

Although the only skill in playing the game is having a quick hand to move the block across the screen it is an extremely compulsive reaction game.

The points system is simple, one point for each bomb, but the score can quickly mount up.

Kaboom the Mad Bomber will torment your life for £18.95 from Activision UK distributors.

PITCHING FOR WORLD CUP PLAY

FOOTBALL AND ICE HOCKEY

Football fans are in for a good time next year with the World Cup in full swing.

Games centres are well catered for on the football front, the latest to add one to its range is Philips for the G7000. In this version the match is fought out between two five man teams, each complete with a goalie. The men are moved around the pitch with the joystick and you use the fire or action button to shoot.

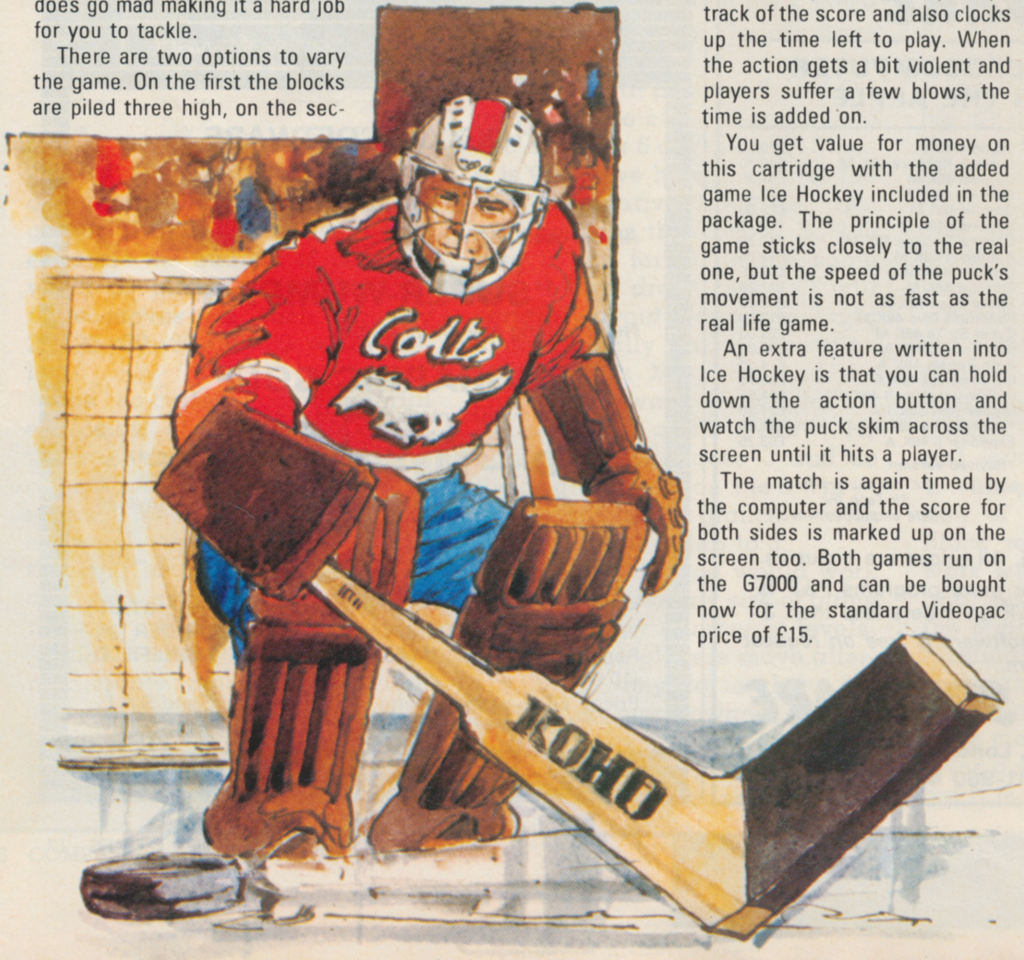
You need a good eye for a ball and an alert mind to check at an instant where members of the opposing team are. If you want to pass the ball to another player just press the fire button, but be careful not to let it be intercepted by the opposition.

The computer memory keeps track of the score and also clocks up the time left to play. When the action gets a bit violent and players suffer a few blows, the time is added on.

You get value for money on this cartridge with the added game Ice Hockey included in the package. The principle of the game sticks closely to the real one, but the speed of the puck's movement is not as fast as the real life game.

An extra feature written into Ice Hockey is that you can hold down the action button and watch the puck skim across the screen until it hits a player.

The match is again timed by the computer and the score for both sides is marked up on the screen too. Both games run on the G7000 and can be bought now for the standard Videopac price of £15.



ANOTHER BRICK IN THE WALL

SUPER BREAKOUT

Being trapped in a small space means horror for the claustrophobic and Super Breakout will have them crying out in anguish.

The only way to get out of the dilemma is to dislodge the bricks above you which are four layers deep. On either side of these layers the walls hem you in so you are truly trapped.

Super Breakout is one of the latest games for the Atari Video Computer System following the traditional version. Five different variations of play are included in the package, regular Breakout, Double Breakout, Cavity Breakout and Progressive Breakout. All for one or two players.

At the bottom of the screen is a bat which you control, using the Atari's compatible paddles. When the game kicks off a ball is served into the play area which you have to bounce off your block to make it rebound against the coloured bricks at the top of the screen.

Each brick you successfully knock out disappears from the screen and you are awarded points.

Bricks in the first two rows of the regular game go for one point each. The second and third rows are worth three points each and the fifth and sixth ones will net you five per brick, and the seventh and eighth rows bricks earn you seven points each.

Depending on the game variation you play and certain stages reached in the play the points are sometimes doubled or tripled. On Double Breakout the maximum score is infinite, so you can go on building up a high score indefinitely.

Another feature is a children's version making the game easier if you want to let the kids let rip. The difference is that the speed of the game is slowed down so you have more time to react and judge the best place to position your bat to hit the ball.

The cartridge sells for £14.95, from Atari distributors.

ROCKS FOR ALL AGES

BEST SELLERS

Asteroids made the transition from arcade to home entertainment centre far more successfully than its predecessor, Space Invaders. Atari came up with the arcade game and were first to include a cartridge for the video computer system — which now outsells Space Invaders — and it resulted in an international competition last November to find the top scorer.

The target is 142,910 points, which an American player achieved, to win the contest.

The asteroids hurtle through the cosmos, each hit splitting them in half, each sized rock being worth a certain number of points. The smallest ones net 100, downwards to 10 for a giant rock. With the difficulty button on a blue flying saucer whizzes through the storm, firing on your ship.

The spacecraft can be rotated left or right to fire and moved out of position by use of the thrust which propels it in the direction it is pointing.

Other features incorporated into different versions of the game (there are 66) include: hyperspace, which transports you instantly out of danger to another area of the screen.

In other versions you can have the hyperspace swapped for protective shields which enable you to pass through asteroids, but these are only effective for a brief second and then blow you up if over used. And finally a "flip" effect enables your ship to spin 180° and fire at oncoming danger from both sides very quickly.

You are given five lives to start off the game but extra ones are available every 5, 10, or 20 thousand points, depending on the difficulty you set yourself. In later walls the large blue saucer is replaced by a far more deadly small green one who homes in on your ship much quicker. With each cleared screen more rocks are added to the game.

Guaranteed to hold your attention, it costs £34.50 from Atari's U.K. distributors.

ACTION IN THE AIR-WAYS

TRIPLE ACTION

There's real skill when you take to the airways in Triple Action.

You are in command of one of two planes engaged in battle aiming to score 15 points before your opponent. To score points you must shoot down the opposition or get a direct hit at the balloon which begins its ascent from a platform in the middle of the screen.

Cloud formations are dotted in the sky for you to use as cover if you want to hide from your opponent in the heat of a dogfight. Make the most of the cloud cover during battles.

Your armaments consist of either short or long range bullets.

Battle Tanks is another of the games on the same Intellivision cartridge.

The object is to beat an enemy tank by destroying it with your own shells. On the screen are positioned several walls differing in length as well as clumps of trees. The walls can be used as a protective shield, from enemy fire. But watch out if you let your tank lurk behind the trees, because those can be blasted to smithereens.

Opt for the third game, Car Racing, and you have to race against the clock over a distance of 100 miles. Not only do you have to keep your car on the straight and narrow, but you also have to dodge other traffic on the road.

This Triple Action cartridge is available from Intellivision's distributors via Advanced Consumer Electronics (ACE) of north London for the standard price of £18.95.

HELP THESE CHICKS CROSS THE ROAD

FREEWAY

Why did the chicken cross the road? goes the old children's joke.

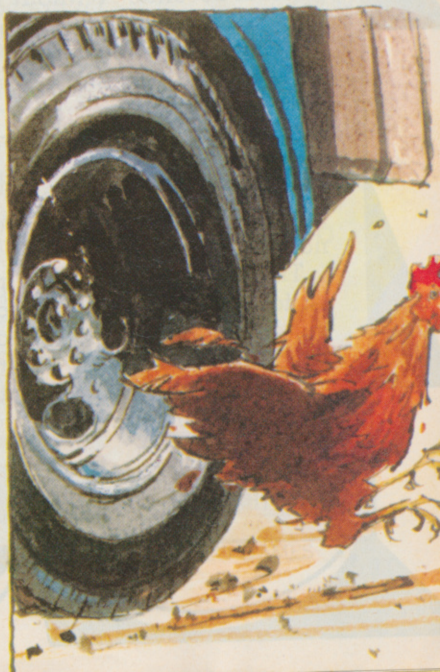
If you found the answer unconvincing as a child, then you will find it totally implausible when you plug the Freeway cartridge into your Atari Video Computer System.

Two chickens are in a race to get to the other side of a 10 lane motorway which is jam-packed with traffic. Every time you manage to dodge the cars and lorries and successfully cross the 10 lanes you score a point.

There are two levels of difficulty and eight different game versions, in each one the traffic speeds up slightly. You can't judge when to leap out into the roads because the cars and lorries' speeds are randomly generated. The lower numbered game variations are only plagued by cars rather than lorries which makes the traffic easier to jump. On version eight the freeway is filled with heavy lorries.

You use the joystick to manoeuvre your chicken across the road, but you can only move him up or down, not sideways.

Freeway is one of the latest cartridges out for use on the Atari games centre and is made by the US firm Activision. It will cost you £18.95.



TAKE YOUR CUE FROM THE U.S.

BILLIARDS

Potting the coloured balls in the pockets of a snooker table is a real test of your judgement of distance and angles.

Line up your cue in one of two snooker table games just released for the Philips G7000 television games centre. Eight Ball and Rotation are versions of two popular American games translated for a British audience.

In Eight Ball the idea is to pot the two dark balls which lie in a 10 ball triangle. The option is open for you to try and beat the computer or to challenge a friend. Whoever is the first person to put the two dark balls in the pockets wins.

Rotation is also played with 10 balls. But this time there are five blue ones and five yellow, excluding the cue ball. The aim is to pocket as many balls as possible. If you get bored with that you can design your own variation. Why not put a value on the different balls, or try pocketing alternating coloured balls, or how about each player opting to put down a certain colour? The decision is yours.

Coming in one cartridge Eight Ball and Rotation costs £15.

REVERSI

By Tom Napier

Reversi is the old English name for the board game which has recently become popular as Othello since being re-invented in Japan.

As Othello is the trade name for the game we have decided to revert to calling our column "Reversi" as this is the name frequently given to computerised versions of the game.

SCREENING YOUR PROGRAM

There are plenty of practical problems which crop up when putting the game of Reversi on a computer screen.

Leaving the actual programming of the machine to play a good game aside for a moment, in just representing Reversi on a screen there are several guidelines which can help in the presentation of the game.

The problem arises when one tries to show a board and pieces on a screen, since almost every computer has its own unique way of doing this.

The method I used was to draw the fixed information such as the board and its square numbering using Basic PRINT statements and then to POKE the pieces into the correct memory locations to make them appear on the board.

This is much quicker than reprinting the whole display after each move.

My board is pale blue with dark blue lines dividing the squares. The machine plays with blue pieces and the human player with red ones. One afterthought that turned out to be essential was to make each newly placed piece flash for several seconds. Without this, it was difficult to spot where the computer had moved, particularly once it had started turning over the pieces.

However, it's not impossible to write a Reversi program on a non-graphic monochrome computer, it's just a little slower and not so pretty.

The strategy my program uses is: for every unoccupied square, test to see if a legal move is possible. If it is, evaluate the move and compare it with the best move found so far. Save the better move.

After testing all the squares, play the best move found. Turn over all the appropriate pieces then wait for the human player's response. Test that the human player's move is legal and display the new board position if it is. Repeat until either both players pass on successive moves or move 65 is reached. Add up totals of both players and announce winner.

I have glossed over the move evaluation routine. A simple program will use two Basic arrays, one 10 by 10 to represent the state of the board and another that contains the desirability factors assigned to each square. The board state array is 10 × 10 in size simply to enable the edge of the board to be indicated to the legal move testing routine.

The same routine is used to check the legality of both player's moves by changing the value of the flag "P". Assuming the square concerned is unoccupied it goes like this. For direction 1 to 8, keep stepping out so long as only opposing pieces are encountered. If a space or the board edge is found, try the next direction, if a friendly piece is found in a direction that contains at least one opposing piece then the move is legal. It's shorter in Basic than in English!

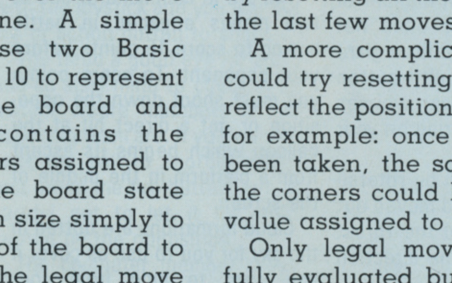
To evaluate a move the routine adds twice the value of the square played on to the sum of values of the pieces captured. The values assigned, which should be varied by anyone experimenting with the program, reflect such factors as the desirability of corner and edge squares and the relative undesirability of squares that enable one's opponent to make a corner or edge move.

Towards the end of the game, positions are relatively unimportant and only sheer numbers matter, this is reflected by resetting all the values to 1 for the last few moves.

A more complicated program could try resetting the values to reflect the position of the pieces, for example: once a corner has been taken, the squares next to the corners could have a higher value assigned to them.

Only legal moves should be fully evaluated but even so the computer will take 15 to 25 seconds to make up its mind. First attempts should not try to make the machine look at its opponent's possible responses, it would just take too long.

One compromise I have worked on but not yet completed is to write the move examination routines in machine code while still using Basic for the rest of the program. This would speed things up enormously.



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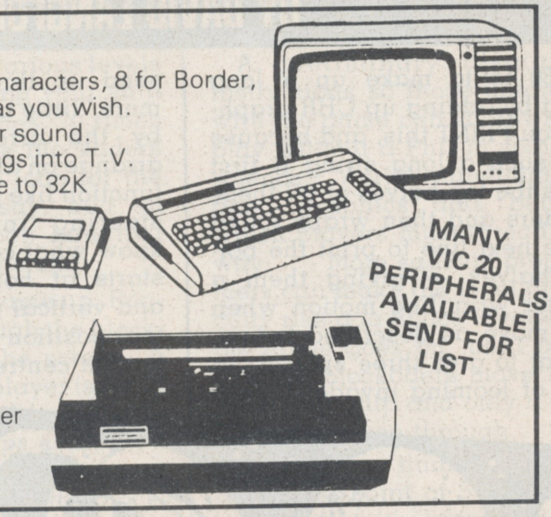

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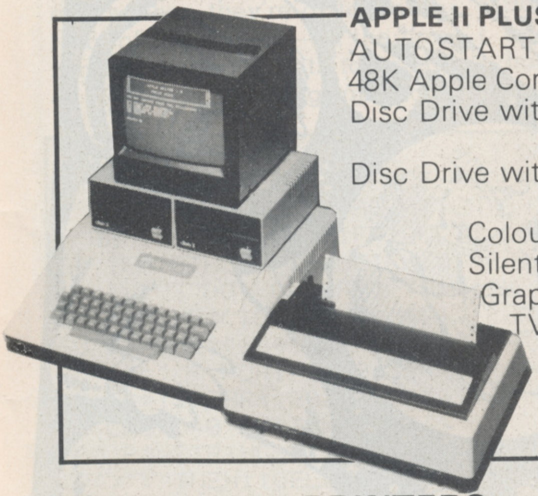

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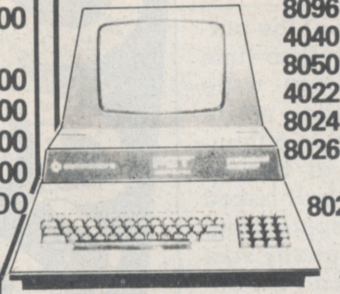

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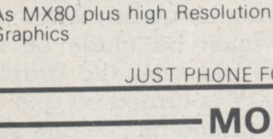

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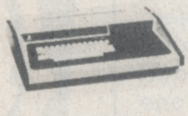

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Access

COMPUTER

BY DAVID LANGFORD

Space craft and alien beings were the preserve of the science fiction enthusiast long before they began appearing on our computer screens.

Sci-fi also has a long tradition for being the most innovative family in the literary clan. We thought we should tap this source of new ideas and invited author David Langford of the Science Fiction Foundation to lead us gently into the diverse futures imagined by the latest science fiction authors.

David will sift through the latest ideas and reproduce the best of these and provide some greatly appreciated humour on the way.

In his first column, David looks at one way for beginners to approach giving a game a science fiction feel and presents a simple example, Space Blockade.

New computer owners may well be alarmed by the awesome accuracy seemingly needed to prepare a lengthy Basic program.

Ignoring the frowns of the purists (the ones who have no time for you unless you can write fluent machine code while standing on your head in a thunderstorm), let's look at how to cheat — to work up a half-baked idea into a tiny but operational computer game without any vast planning. You might call it computer doodling.

My wife, disgruntled by picketing at her office, suggested a game where you had to steer small unfortunate non-union people though immense and menacing picket lines. Thus, one non-sober evening, the game of "Flying Pickets" came into being. Let's not deal with such politically sensitive matters but with the almost indistinguishable game called "Space Blockade" which I've just invented out of sheer cowardice.

A horde of evil extraterrestrials hangs over the Earth. Our planet is doomed and must be evacuated. One by one Earth's brave little ships boost into space, only to perish miserably by collision with the aliens' invulnerable force screens . . . unless you steer between them.

Obviously this is dead easy unless the fiendish baddies keep on the move. One simple-minded way of doing this on my TRS-80 is to make up a long string by adding up CHR graphics: you PRINT this, and because it is such a long string it first prints the top halves of all these invaders and then wraps round to the next line to print the bottom halves — giving them a sinister wriggling motion when they move as described below. Repeat to give three spaced-out rows of looming invaders, each row starting at the left-hand edge of the screen and reaching not all the way across.

Repeat the PRINT again and again for all three, stepping up the TAB function or equivalent to overprint and have these blockade lines shuffle a space to the right each time. When they reach the right-hand edge you can start them moving back again. Three rows of monstrous Things sidling to and fro in the sky.

The simplest "Earth ship" to send up through that lot is a mere "little moving blot" steered by the arrow keys: easy to arrange on any machine, using a function like INKEY to read in the steering instructions. You'll know what comes next: the ship starts at horizontal position X and vertical (measured from the top) position Y somewhere near bottom centre of the screen, and moves depending on which arrow key was last pressed.

If it was the up-arrow then the new Y must be made on less than the old one; the graphics blot at X,Y is turned off and that at X,Y-1 turned on . . . and so on in a loop until a different arrow key is pressed.

If you go straight up like that, the chances are that sooner or later you hit one of the Things in the sky, and are blown to smithereens. The program should test the new point X,Y on the display before turning it on

DOODLING

to move the "ship" there: if it's already occupied, then *blooie!* You can set various levels of difficulty by letting your ship move twice, five times, 10 times for each move of the blockaders — have an endless loop for the moving invaders, say, and an inner FOR-NEXT loop handling the movements of the ship.

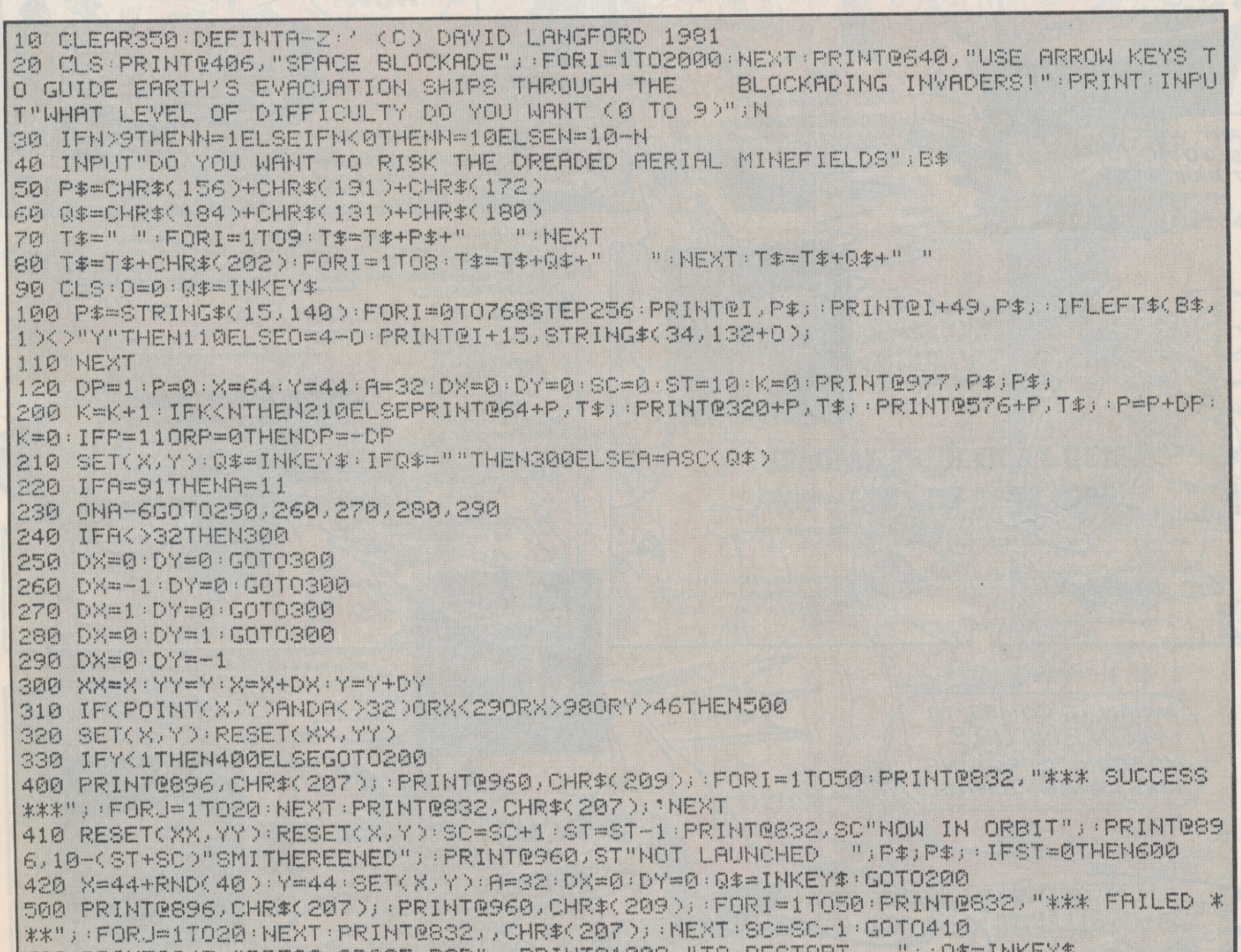
Finally, tidy the game up. Fanfares if you get through the blockade to the top of the screen. A counter giving the player (say) 10 ships. A score display in some handy corner: *4 ships escaped, 3 lost, 3 to launch.* A trap to prevent people sneaking round the blockaders when they're at far left or right of the screen — if the horizontal position X gets too small or too large the program blows you up anyway for, er . . . using too much fuel.

A preliminary display of instructions so those unfamiliar with the game can sit down and play without a PhD in computer science. "Aerial minefields" of fixed graphics dots between which players must thread their way . . . More sadistic programmers can make the level of difficulty rise *a la* Space Invaders as the game goes on, until by the end the blockaders move faster than your ship and only a miracle can get you through.

But you can think of your own frills. The point of Space Blockade is that it's reasonable fun and can be put together in a few hours only, by a process of computer doodling: you produce that line of hulking figures, then three lines, then three *moving* lines, then add the escaping ships and as many as you like of the frills above . . . Take it slowly. And if you were nervous about programming your own games, you should be a lot less so when you've finished.

Here's one way of cobbling together Space Blockade on a TRS-80 (Level II). Almost certainly it's not the best way. The lowest level of difficulty is very easy, the highest too hard — though there's a deliberate bug included to ensure the author can always win and amaze his friends by sneaky use of the space bar.

Don't just copy or adapt this version if you're new to computing: it's much more interesting to tackle the programming yourself, along the lines suggested. The general approach should work on any machine with a memory-mapped display.



```
10 CLEAR350:DEFINTA-Z:' (C) DAVID LANGFORD 1981
20 CLS:PRINT@406,"SPACE BLOCKADE";:FORI=1TO2000:NEXT:PRINT@640,"USE ARROW KEYS T
O GUIDE EARTH'S EVACUATION SHIPS THROUGH THE    BLOCKADING INVADERS!":PRINT:INPU
T"WHAT LEVEL OF DIFFICULTY DO YOU WANT (0 TO 9)";N
30 IFN>9THENN=1ELSEIFN<0THENN=10ELSEN=10-N
40 INPUT"DO YOU WANT TO RISK THE DREADED AERIAL MINEFIELDS";B$
50 P$=CHR$(156)+CHR$(191)+CHR$(172)
60 Q$=CHR$(184)+CHR$(131)+CHR$(180)
70 T$=" ":FORI=1TO9:T$=T$+P$+"    ":NEXT
80 T$=T$+CHR$(202):FORI=1TO8:T$=T$+Q$+"    ":NEXT:T$=T$+Q$+" "
90 CLS:O=0:Q$=INKEY$
100 P$=STRING$(15,140):FORI=0TO768STEP256:PRINT@I,P$;:PRINT@I+49,P$;:IFLEFT$(B$,
1)<>"Y"THEN110ELSEO=4-O:PRINT@I+15,STRING$(34,132+O);
110 NEXT
120 DP=1:P=0:X=64:Y=44:A=32:DX=0:DY=0:SC=0:ST=10:K=0:PRINT@977,P$;P$;
200 K=K+1:IFK<NTHEN210ELSEPRINT@64+P,T$;:PRINT@320+P,T$;:PRINT@576+P,T$;:P=P+DP:
K=0:IFP=11ORP=0THENDP=-DP
210 SET(X,Y):Q$=INKEY$:IFQ$=""THEN300ELSEA=ASC(Q$)
220 IFA=91THENA=11
230 ONA-6GOTO250,260,270,280,290
240 IFA<>32THEN300
250 DX=0:DY=0:GOTO300
260 DX=-1:DY=0:GOTO300
270 DX=1:DY=0:GOTO300
280 DX=0:DY=1:GOTO300
290 DX=0:DY=-1
300 XX=X:YY=Y:X=X+DX:Y=Y+DY
310 IF(POINT(X,Y)ANDA<>32)ORX<29ORX>98ORY>46THEN500
320 SET(X,Y):RESET(XX,YY)
330 IFY<1THEN400ELSEGOTO200
400 PRINT@896,CHR$(207);:PRINT@960,CHR$(209);:FORI=1TO50:PRINT@832,"*** SUCCESS
***";:FORJ=1TO20:NEXT:PRINT@832,CHR$(207);'NEXT
410 RESET(XX,YY):RESET(X,Y):SC=SC+1:ST=ST-1:PRINT@832,SC"NOW IN ORBIT";:PRINT@89
6,10-(ST+SC)"SMITHEREENED";:PRINT@960,ST"NOT LAUNCHED  ";P$;P$;:IFST=0THEN600
420 X=44+RND(40):Y=44:SET(X,Y):A=32:DX=0:DY=0:Q$=INKEY$:GOTO200
500 PRINT@896,CHR$(207);:PRINT@960,CHR$(209);:FORI=1TO50:PRINT@832,"*** FAILED *
**";:FORJ=1TO20:NEXT:PRINT@832,,CHR$(207);:NEXT:SC=SC-1:GOTO410
600 PRINT@945,"PRESS SPACE BAR";:PRINT@1009,"TO RESTART...";:Q$=INKEY$
610 PRINT@881,"** GAME OVER **";:FORI=1TO40:NEXT:PRINT@881,CHR$(207);:FORI=1TO40
:NEXT:IFINKEY$=" "THEN20ELSE610
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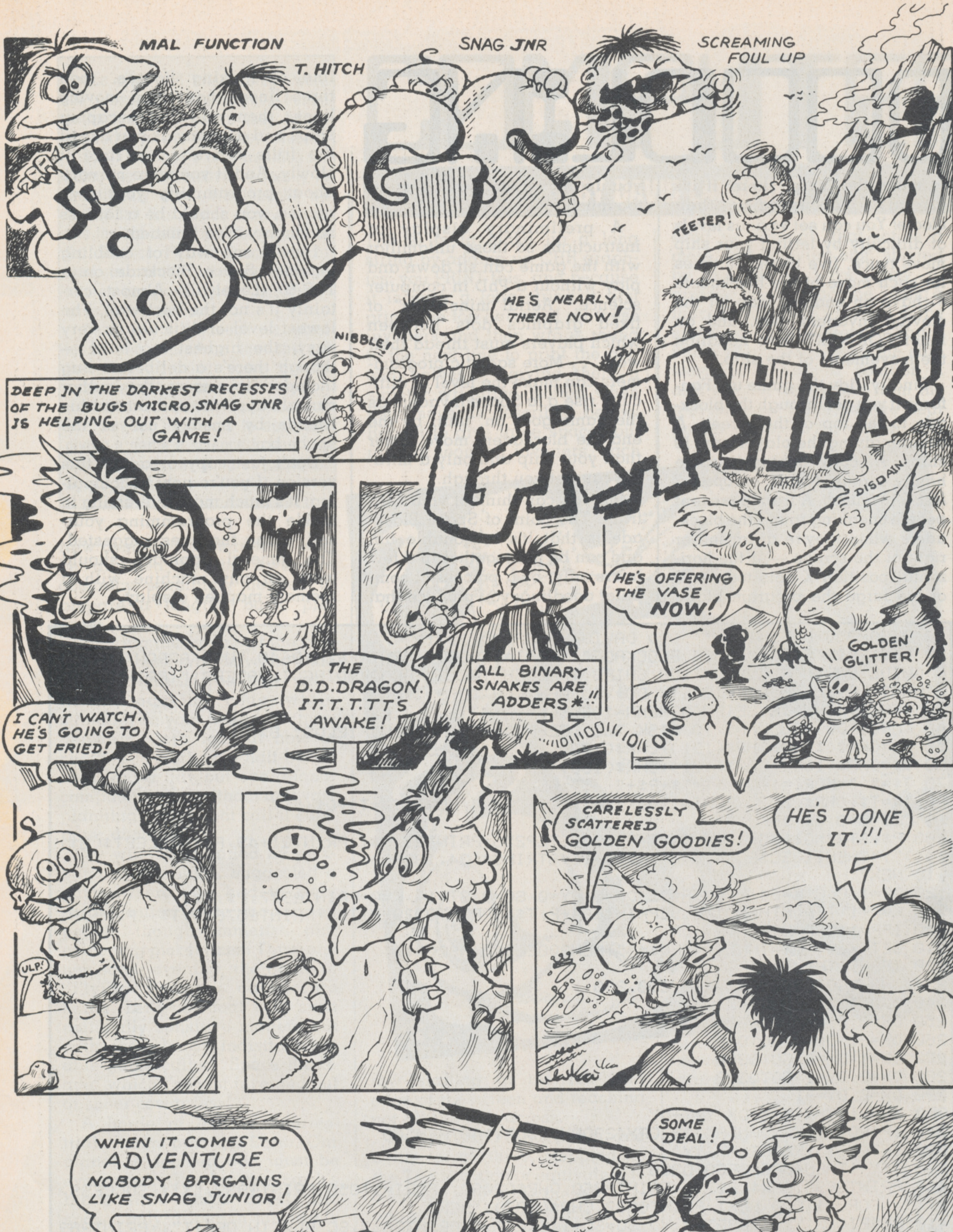
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TEETER!
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I CAN'T WATCH. HE'S GOING TO GET FRIED!
THE D.D.DRAGON. IT.T.T.TT'S AWAKE!
ALL BINARY SNAKES ARE ADDERS*!!
HE'S OFFERING THE VASE NOW!
GOLDEN GLITTER!
ULP!
!
CARELESSLY SCATTERED GOLDEN GOODIES!
HE'S DONE IT!!!
WHEN IT COMES TO ADVENTURE NOBODY BARGAINS LIKE SNAG JUNIOR!
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ARCADE

TIPS

MISSION (ALMOST) IMPOSSIBLE

Scramble was the first arcade machine to send you on a mission and quickly earned a big following.

Armed with a spaceship which fires bullets and drops bombs, the player is given differing stretches of terrain to cross and a variety of things to blow up.

The secret of the game is screen position. Where you are on the screen dictates how much manoeuvreability the craft has and how well it can avoid obstacles and hazards.

The screen background is rolling constantly forwards and your speed is regulated by a joystick-type lever which moves you up and down and backwards and forwards. Pushing the lever back enables your craft to "hover" against the background, until you come to the back of the screen.

The first screen gives a mountainous background with ground-to-air missiles, installations and fuel dumps. Fuel is the crucial consideration in Scramble, as without it, you will plummet from the sky. Extra fuel is obtained by blowing up fuel dumps and on this first easy scenario the player should take his time and bomb as many dumps as possible.

Memorising screen positions is a vital part of achieving a good score as in the same situations, missiles fire at the same time.

The installations in the fourth wall can only be bombed (not shot) and the screen closes up to leave a very narrow, vulnerable space at the top of the screen.

But it is the fifth wall, the maze, which causes the most problems, as it involves long vertical stretches which can only be negotiated by careful use of the joystick, moving as far forward as possible and then drifting back with the screen.

The flag for the first series of screens successfully completed can be earned by either shooting or crashing into the robot figure by the skyscraper after the maze.

TERRY ROGERS

THE SUPER GALAXIANS

GALAGA

The Galaga race has arrived on the British arcade scene. In our December issue we warned of the coming invasion of a new improved Galaxian and now we can fill in a few more details of this new foe.

Like Galaxian the creatures fly in formation above the firing spaceship under your command, and swoop down to attack, firing bullets as they come.

Unlike their predecessors, the creatures first fly into formation from the edges of the screen, giving the player an extra opportunity to shoot them. They also swoop back up to join their comrades after an unsuccessful dive — disconcertingly appearing under your craft.

The Galagas themselves, are the leaders of the creatures and must be hit twice to successfully kill them off. When they reach the bottom of the screen, they generate an energy cone and capture your spaceship, carrying it to the top of the screen. If you have no reserve spare spacecraft left, the game is over, if you do, then the challenge is to shoot the Galaga without hitting your own ship and so rescue it.

If you manage this, the second craft teams up with the first to fire in tandem, making a much more efficient defence force.

The first and second stage are the same but then you enter the first challenge stage with the 40 craft flying, without firing, across the screen — hit them all for a 10,000 bonus — very useful when you consider that 20,000 brings a new spacecraft.

The second challenge stage really needs a tandem ship to achieve this and the third challenge stage makes the creatures faster still.

In later screens the droid ships flash red and split into three "scorpion" craft which swerve all over the screen.

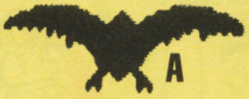
Another feature of the game is that it is possible to develop a technique for almost continuous fire by flicking the fire button hard and fast. Plenty of scope for the good player and a succession of new challenges.

KNOW YOUR CREATURES

How many arcade creatures did you get right? We put a Taito space invaders table up for grabs for the person who could correctly name the machines which these nine arcade inhabitants come from.

(A) Pheonix
(B) Galaxian
(C) Moon Cresta
(D) Defender
(E) Galaxian
(F) Space Invader
(G) Space Fury
(H) Wizard of Wor
(I) Mazeman, Puckman or Pac-man

The name of the winner will be announced in our March issue.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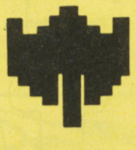
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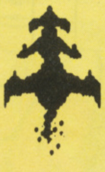
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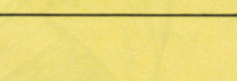
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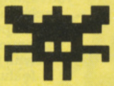
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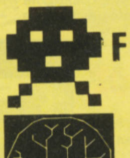
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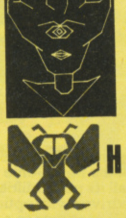
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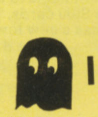
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I

CONFESSIONS OF AN ARCADE RODENT

MOUSETRAP

Puckman with a Tom and Jerry theme is the essence of Mousetrap.

In this maze-chase game, the player takes on the role of the mouse, and the villains are the cats.

The mouse has to run around the maze eating pieces of cheese with the cats chasing after him. There are doors which our rodent hero can close behind him to fend off the enemy.

The other recourse of the cornered mouse is to eat a bone. Bones are dotted around the screen like the flashing energy dots in Puckman and have a similar effect — they turn the player into a dog for a short time and during that period he can turn the tables on the cats, which do their best to escape.

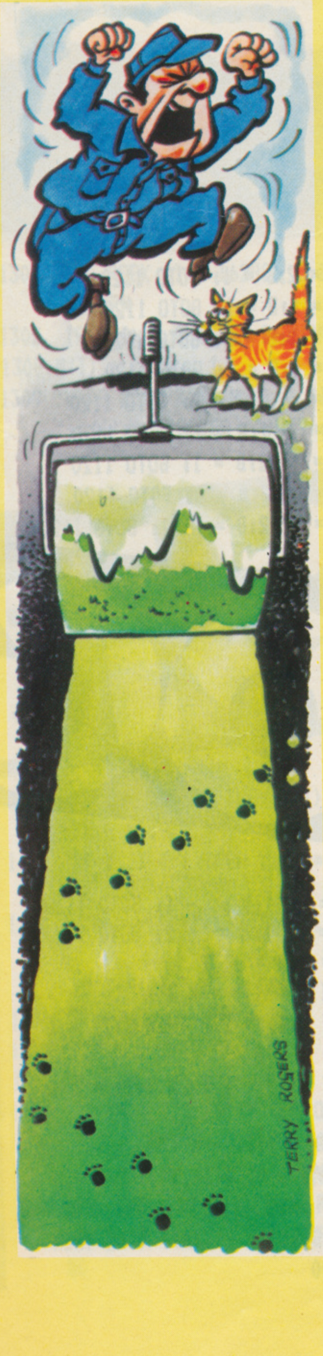
Up until here it all seems very reminiscent of the Puckman game but there are a few extra features which add to the problems of being an arcade mouse.

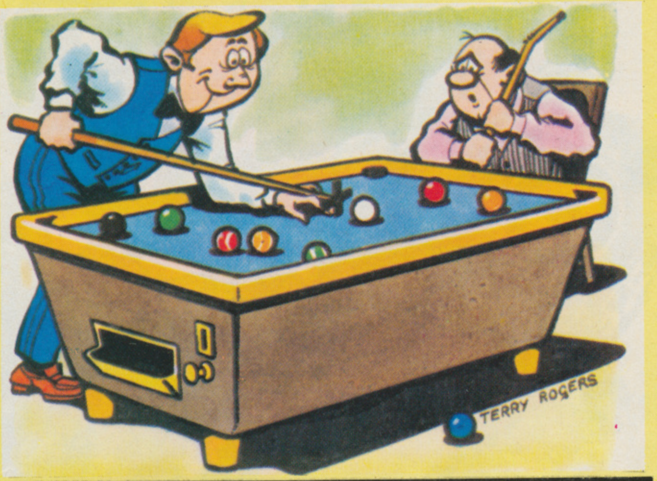
Birds fly around the screen and will eat the mouse if they come across him. The mouse can escape the birds by hiding in the corners of the screen.

It is an all-action affair which builds logically on the success of Puckman but requires the player to think further ahead.

After finding that frogs make very acceptable screen heroes, the arcade industry is following this theory to its logical conclusion.

The cartoon heroes seem ideal participants of this new arcade game which features, cheese, mice, cats and dogs — in short all the ingredients of a successful cartoon adventure.





VIDEO POOL

Take your cue from the U.S.

The American pool table ousted the native bar billiards from numerous public bars, many years ago.

But with the necessity of finding cue space all around the bulky tables, many pubs found that they could not afford the space to incorporate a pool table.

But the video games industry came up with an electronic solution by fitting pool into arcade games cabinet.

Video Pool is already proving a popular addition to the arcade scene. Instead of using a cue, players have to perfect the skill of lining up a cross on the cue ball.

This technique has already been used in computer versions of snooker.

It needs a good eye to line up the cross so the cue ball is hit at the required angle.

For those who have not tried their hands at the game Americans swear is better than snooker, the aim is to pocket your own balls while leaving your opponents' on the table.

The 15 balls are divided into two groups of seven, spots and stripes, and the black "8" ball which must be left to last.

The winner is the first player to pocket his own seven balls and then down the black.

GLOSS OVER THESE GHOSTS

CRASH ROLLER

Do-it-yourself addicts now have an arcade game based on their activities.

Following the craze for more down-to-Earth themes on the arcade scene, comes Crash Roller, which could as well be named, "Crazy decorator".

The game is similar to the Puckman/Mazeman type chase game with ghost-like creatures chasing our intrepid D.I.Y. enthusiast through a series of interlocking roadways.

But while in the Mazeman game, the idea is to eat the spots, here the player must paint over the roadways.

It is more difficult than its predecessor although there are only two ghosts in this version. They are faster than their Puckman counterparts and slightly quicker than the painter.

To combat this, the painter can run to one of two bridges which are incorporated on the roadway. There he can grab a huge paint roller and turn the tables on his pursuers in an effort to paint over them. Bonus scores are collected for each ghost who is caught beneath the paint roller.

The game is further complicated by the random appearances of creatures who will mess up the decorator's handiwork. A cat, bird or motor car will appear — in much the same way as fruit does on Puckman — but these do not just offer bonuses.

The cat, for example leaves footprints in the paintwork and must be painted flat and his footprints painted over. It is very easy to find yourself cursing these interruptions as a real decorator would any feline criminal.

Bonuses are offered for clearing screens in a good time and a new screen appears to be filled in another bright colour. The first screen for instance, in a lurid green. An optional feature is provided in black holes that appear randomly in the roadway and the decorator can disappear down these.

The bridges are an interesting feature, in that you can run over and under them.

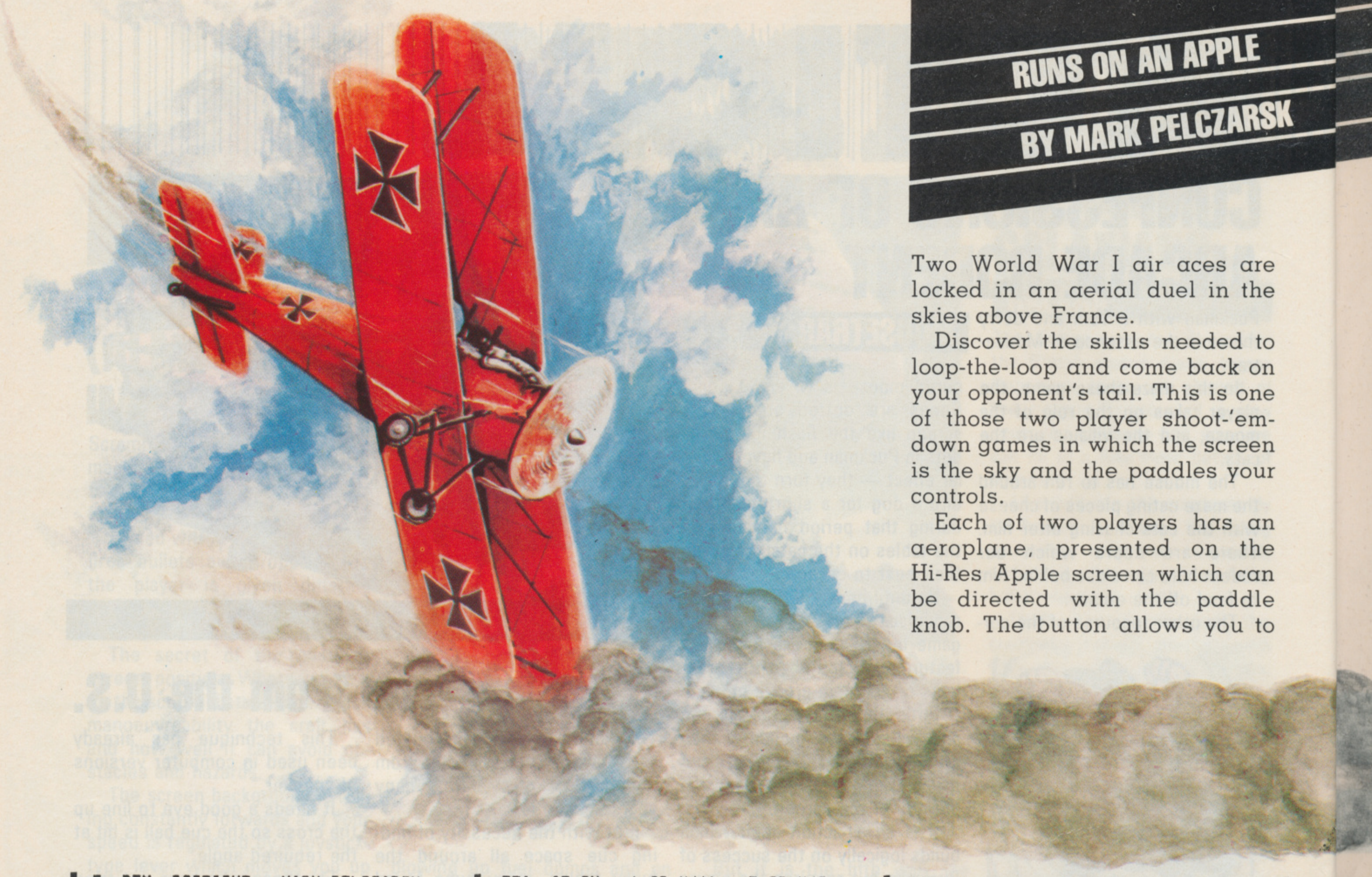
RUNS ON AN APPLE

BY MARK PELCZARSK

Two World War I air aces are locked in an aerial duel in the skies above France.

Discover the skills needed to loop-the-loop and come back on your opponent's tail. This is one of those two player shoot-'em-down games in which the screen is the sky and the paddles your controls.

Each of two players has an aeroplane, presented on the Hi-Res Apple screen which can be directed with the paddle knob. The button allows you to



DOG

```
5 REM  DOGFIGHT - MARK PELCZARSK
    I, 1980
10  GOSUB 6000
20  POKE 232,0: POKE 233,3
22 BA = 0:PC(1) = 3
23 PC(2) = 6
24  HOME
27 S = 2
28 R2 = 3
152  INPUT "YOUR NAME? ";A$
154  INPUT "OPPONENT'S NAME? ";B$

160  INPUT "SPEED (1-10) ?";K
170 R = 8:SW = 0
180  SCALE= S
190  HGR
195  HCOLOR= BA: HPLOT 0,0: CALL
     62454
200  HOME : VTAB 21: PRINT A$,"
     ";B$
300 X(1) = 20:Y(1) = 120
310 X(2) = 160:Y(2) = 120
320 D(1) = 16:D(2) = 16
400  FOR I = 1 TO 2: ROT= D(I) *
     4: HCOLOR= PC(I)
405 H(I) = 0:M(I) = 16
410  DRAW 1 AT X(I),Y(I): NEXT I
420  VTAB 23: PRINT "PRESS ANY KE
     Y TO START": GET C$
500  FOR I = 1 TO 2
505 J = 3 - I
510  GOSUB 1000
520  NEXT I
530  IF SW = 1 OR H(1) = 5 OR H(2
     ) = 5 THEN 4000
540  GOTO 500
1000  HCOLOR= BA: ROT= D(I) * 4
1010  DRAW 1 AT X(I),Y(I)
1020 C =  PDL (I - 1)
1030  IF C < 20 THEN D(I) = D(I) -
      1: GOTO 1060
1040  IF C > 235 THEN D(I) = D(I)
      + 1

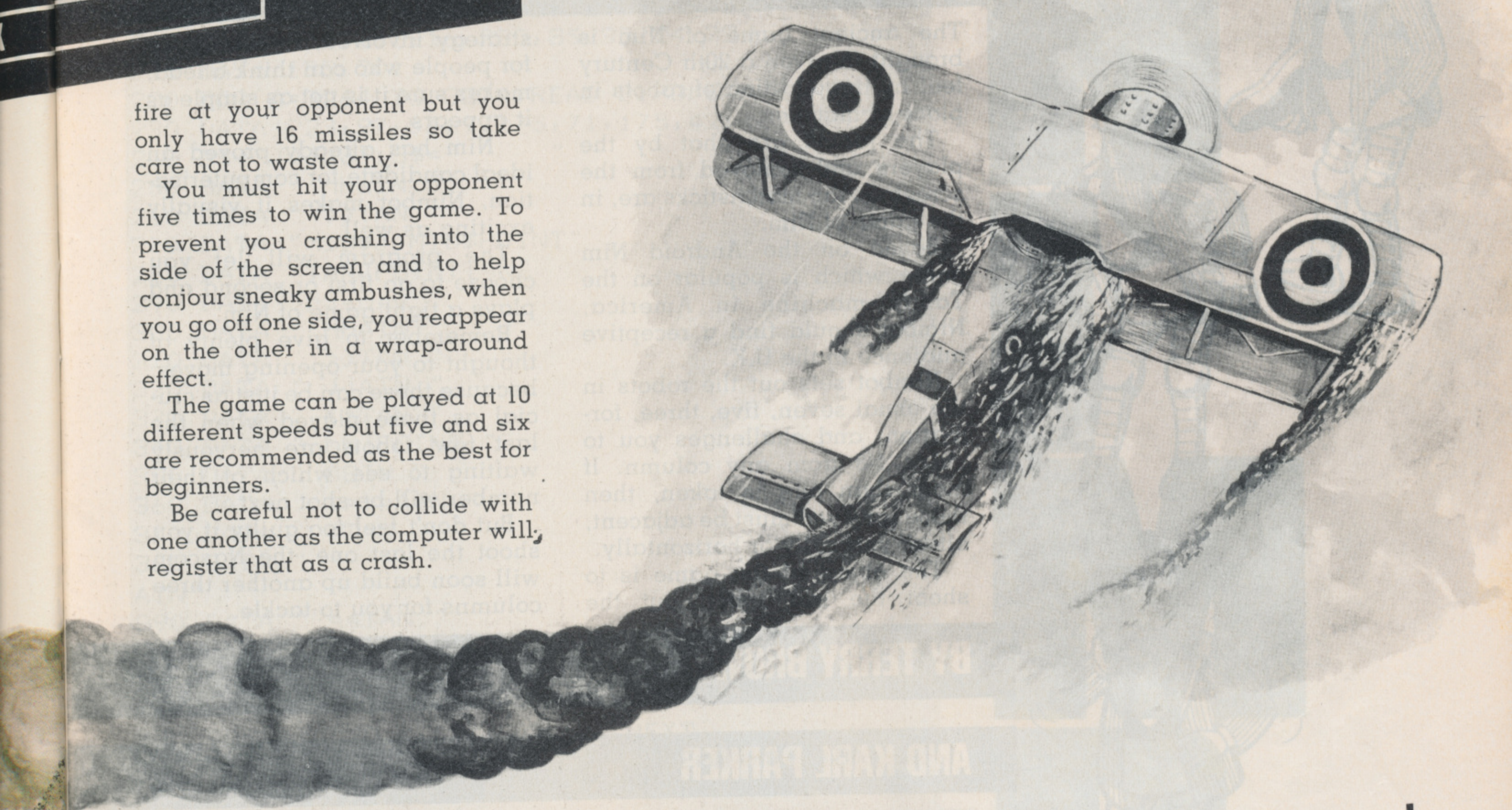
1060  IF D(I) = 0 THEN D(I) = 16:
      GOTO 1080
1070  IF D(I) = 17 THEN D(I) = 1
1080  ON D(I) GOTO 1101,1102,1103
      ,1104,1105,1106,1107,1108,11
      09,1110,1111,1112,1113,1114,
      1115,1116
1101 A = 1:B =  - 2: GOTO 1120
1102 A = 1:B =  - 1: GOTO 1120
1103 A = 2:B =  - 1: GOTO 1120
1104 A = 2:B = 0: GOTO 1120
1105 A = 2:B = 1: GOTO 1120
1106 A = 1:B = 1: GOTO 1120
1107 A = 1:B = 2: GOTO 1120
1108 A = 0:B = 2: GOTO 1120
1109 A =  - 1:B = 2: GOTO 1120
1110 A =  - 1:B = 1: GOTO 1120
1111 A =  - 2:B = 1: GOTO 1120
1112 A =  - 2:B = 0: GOTO 1120
1113 A =  - 2:B =  - 1: GOTO 1120
1114 A =  - 1:B =  - 1: GOTO 1120
1115 A =  - 1:B =  - 2: GOTO 1120
1116 A = 0:B =  - 2
1120 X(I) = X(I) + K * A
1130  IF X(I) > 278 THEN X(I) = X
      (I) - 278
1140  IF X(I) < 1 THEN X(I) = X(I
      ) + 278
1150 Y(I) = Y(I) + K * B
1200  DRAW 1 AT X(I),Y(I)
1250  IF  ABS (X(I) - X(J)) < R2 AND
      ABS (Y(I) - Y(J)) < R2 THEN
      2500
```

fire at your opponent but you only have 16 missiles so take care not to waste any.

You must hit your opponent five times to win the game. To prevent you crashing into the side of the screen and to help conjour sneaky ambushes, when you go off one side, you reappear on the other in a wrap-around effect.

The game can be played at 10 different speeds but five and six are recommended as the best for beginners.

Be careful not to collide with one another as the computer will register that as a crash.



```
1300  IF  PEEK (I - 16288) < 128 THEN
      RETURN
1305  IF M(I) = 0 THEN  RETURN
1308 M(I) = M(I) - 1
1309  VTAB 23: PRINT H(1);" HITS
      ";M(1);" MISSLES  ";H(2);" H
```

```
1345  HCOLOR= BA: DRAW 3 AT XM,YM
1350  NEXT L
1400  IF M(1) = 0 AND M(2) = 0 THEN
      PRINT "YOU'RE BOTH OUT OF M
     ISSLES.":SW = 1
```

FIGHT

```
1160  IF Y(I) > 158 THEN Y(I) = Y
      (I) - 158
1170  IF Y(I) < 1 THEN Y(I) = Y(I
      ) + 158
1190  HCOLOR= PC(I): ROT= D(I) $
      4
      ITS ";M(2);" MISSLES  "
1310 XM = X(I) + A:YM = Y(I) + B
1315  FOR L = 1 TO 40
1320 XM = XM + A:YM = YM + B
1325  IF XM > 278 OR XM < 1 OR YM
      > 158 OR YM < 1 THEN 1400
1330  HCOLOR= 5: DRAW 3 AT XM,YM
1340  IF  ABS (XM - X(J)) < R AND
      ABS (YM - Y(J)) < R THEN 20
      00
```

```
1410  RETURN
2000 H(I) = H(I) + 1
2010  GOSUB 3000
2100  VTAB 23: PRINT H(1);" HITS
      ";M(1);" MISSLES  ";H(2);" H
     ITS ";M(2);" MISSLES  "
2200  IF H(I) < 5 THEN 1400
2210  RETURN
2500  GOSUB 3000
2510  PRINT "YOU DUMMIES CRASHED
      INTO EACH OTHER!!!"
2515 SW = 1
2520  RETURN
3000  FOR N = 1 TO 2
3005  FOR L = 1 TO 5
3010  HCOLOR= L: SCALE= L: DRAW 2
      AT X(J),Y(J)
```

```
3020  NEXT L
3030  HCOLOR= BA
3040  FOR L = 1 TO 5
3050  SCALE= L: DRAW 2 AT X(J),Y(
     J)
3060  NEXT L
3062  NEXT N
3065  SCALE= S
3070  RETURN
4000  IF SW = 1 THEN  PRINT "NO W
     INNER...";: GOTO 4100
4010  IF H(1) = 5 THEN  PRINT A$;
      " IS A WINNER!";: GOTO 4100
4020  PRINT B$;" IS A WINNER!";
4100  INPUT "         TRY AGAIN?";C
      $
4110  IF  LEFT$ (C$,1) = "Y" THEN
      160
4120  IF  LEFT$ (C$,1) <  > "N" THEN
      4100
4125  TEXT
4130  STOP
6000  FOR L = 768 TO 819
6010  READ N: POKE L,N
6020  NEXT
6025  RETURN
6030  DATA  3,0,8,0,21,0,48,0,36,
      18,55,55,9,9,60,60,54,62,9,7
      ,0
6040  DATA  18,62,60,39,45,36,55,
      63,44,44,37,39,45,46,46,44,5
      4,39,55,46,46,52,62,62,36,55
      ,0,63,33,36,0
```

RUNS ON A NASCOM II

The ancient game of Nim is brought in given a 20th Century feel by the addition of robots in place of matches.

The robots are shot by the players and removed from the screen as the matchsticks are, in the game of Nim.

Based on the Android Nim game which is popular on the Tandy machine in America, Nimbot should find a receptive audience in the U.K.

Nimbot sets out the robots in the usual seven, five, three, formation, and challenges you to shoot 1-3 from any column. If more than one is taken, then those removed must be adjacent, either vertically or horizontally.

The object of the game is to shoot the last robot, but the strategy involved, in this game for people who can think ahead, makes sure it is not as simple as it appears.

Nim has already proved an ideal candidate for computerisation, Nimbot makes it visually exciting as well.

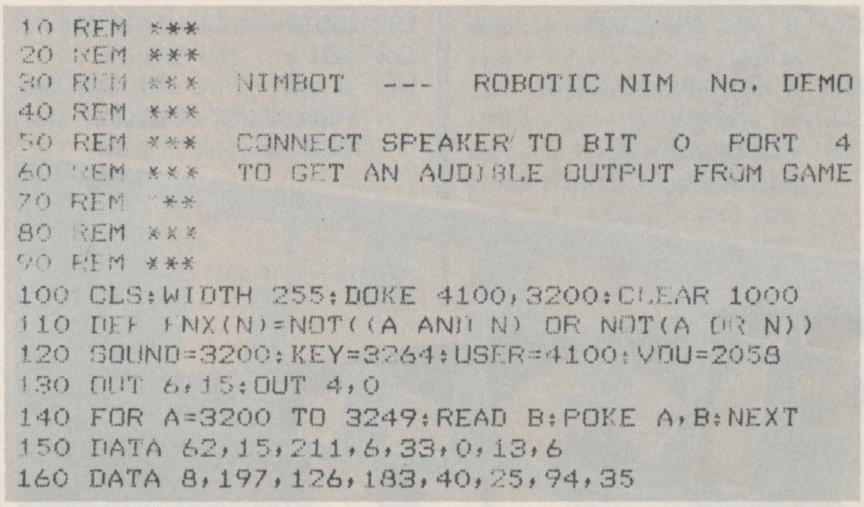
The program will let you choose to go first or second and plays a tight game of Nim.

Remember to give plenty of thought to your opening moves, because these can be just as crucial as those played when the last few robots are nervously waiting to see which of their number will be shot next.

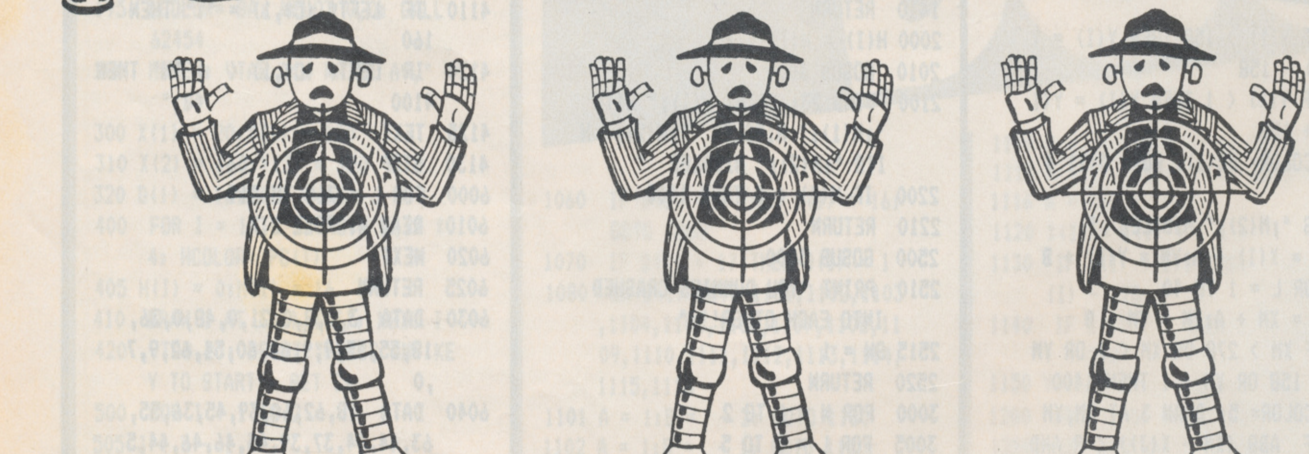
But don't feel too guilty if you shoot the last one, the Nascom will soon build up another three columns for you to tackle.

BY TERRY BROWN

AND KARL PARKER

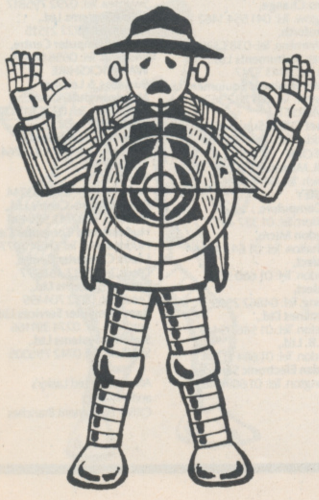


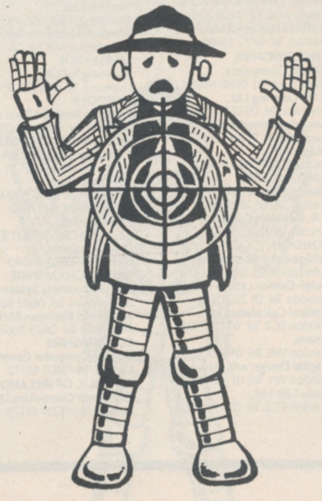
```
10 REM ***
20 REM ***
30 REM ***  NIMBOT  ---  ROBOTIC NIM No. DEMO
40 REM ***
50 REM ***  CONNECT SPEAKER TO BIT  0  PORT  4
60 REM ***  TO GET AN AUDIBLE OUTPUT FROM GAME
70 REM ***
80 REM ***
90 REM ***
100 CLS:WIDTH 255:DOKE 4100,3200:CLEAR 1000
110 DEF FNX(N)=NOT((A AND N) OR NOT(A OR N))
120 SOUND=3200:KEY=3264:USER=4100:VDU=2058
130 OUT 6,15:OUT 4,0
140 FOR A=3200 TO 3249:READ B:POKE A,B:NEXT
150 DATA 62,15,211,6,33,0,13,6
160 DATA 8,197,126,183,40,25,94,35
```

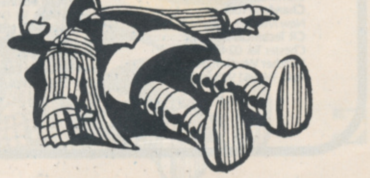


```
170 DATA 86,43,67,62,2,255,16,251
180 DATA 219,4,47,211,4,21,32,242
190 DATA 193,16,230,35,35,24,224,193
200 DATA 201,193,16,230,35.35,24,224
210 DATA 193,201
220 FOR A=3264 TO 3274:READ B:POKE A,B:NEXT
230 DATA 223,97,56,1,175,71,175,42,13,224,233
240 D$="JJJJJ":S$="     "
250 DATA " hhATN "
260 DATA " }}TAN "
270 DATA "MID$JJMID$POINT"
280 DATA "TANJPOINTTAN"
290 DATA "rj-o,v "
300 DATA " hhATN "
310 DATA " }}TAN "
320 DATA " jjATN "
330 DATA " tfTAN "
340 DATA " hMjPOINT "
350 DATA " GSIN "
360 DATA " lplpATN "
370 DATA " fTAN "
380 DATA "
ATN"
390 DATA " qqTAN "
400 DATA " hhATN"
410 DATA " }}TAN"
420 FOR A=0 TO 4
430 FOR A=0 TO 4:READ A$(A):NEXT
440 FOR A=0 TO 5:FOR B=0 TO 1:READ H$(A,B)
450 NEXT B,A
460 FOR A=0 TO 3
470 READ A1(A,0),A1(A,1),A2(A,0),A2(A,1)
480 NEXT
490 DATA 8,7,9,6,8,8,10,6,8,9,11,6,8,10,12,6
500 DOKE USER,KEY
510 CLS:SCREEN 7,7
520 PRINT "Do you want instructions ?(Y or N)"
530 A=USR(0):IF A=0 THEN 530
540 IF A=ASC("Y") THEN GOSUB 1870:GOTO 560
550 IF A()ASC("N") THEN 530
560 N(1)=7:N(2)=5:N(3)=3
570 CLS:A$=" NIMBOT Copyright (C) South East "
580 A$=A$+"London Software":A=0
590 A=A+1:POKE 3017+A,ASC(MID$(A$,A,1))
600 IF A(48 THEN 590
```

NIMBOT







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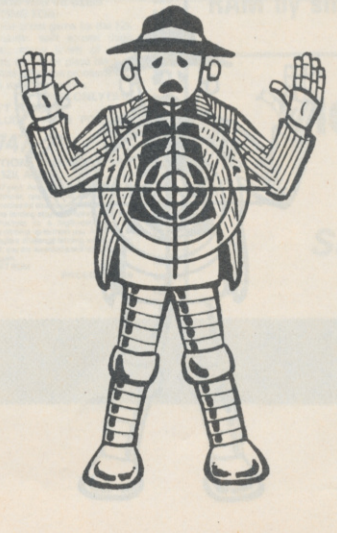
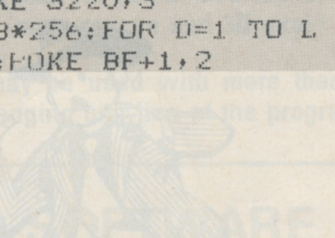
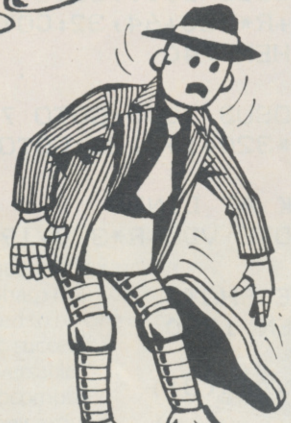
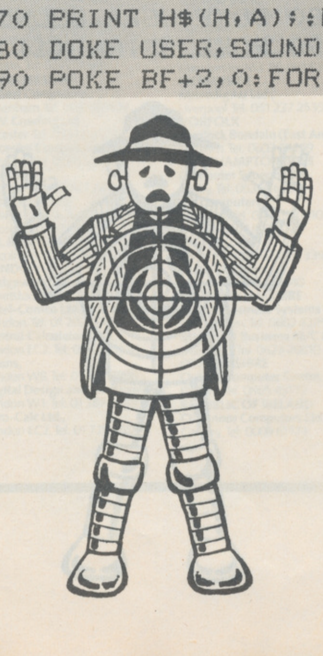
```
610 FOR A=1 TO 15 STEP 5:FOR B=0 TO 4
620 SCREEN 1,A+B:PRINT A$(B);:NEXT B
630 RESET(5,(A-1)*3+7):NEXT A
640 DOKE USER,KEY:SCREEN 10,7
650 PRINT "Do you want first shot ?(Y or N)"
660 A=USR(0):IF A=0 THEN 660
670 IF A=ASC("N") THEN GOSUB 1820:GOTO 870
680 IF A<>ASC("Y") THEN 660
690 GOSUB 1820
700 POKE 3018,42:DOKE USER,KEY
710 A=USR(0):IF A=0 THEN GOSUB 1000:GOTO 710
720 R=A-49:IF R<0 OR R>2 THEN 710
730 POKE VDU+5+R*320+64,A
740 A=USR(0):IF A=0 THEN GOSUB 1000:GOTO 740
750 IF A=8 THEN POKE VDU+5+R*320+64,32:GOTO 710
760 N=A-48:IF N<1 OR N>7 THEN 740
770 POKE VDU+5+R*320+192,A
780 A=USR(0):IF A=0 THEN GOSUB 1000:GOTO 780
790 IF A=8 THEN POKE VDU+R*320+197,32:GOTO 740
800 IF A<>13 THEN 780
810 GOSUB 1300:REM *** LOOK AT LINE
820 POKE VDU+R*320+69,32:POKE VDU+R*320+197,32
830 IF F=0 THEN 710
840 GOSUB 1440:REM *** TAKE SHOTS
850 IF N(1)+N(2)+N(3)=0 THEN 1210
860 POKE 3018,32
870 A=N(1):A=FNX(N(2)):A=FNX(N(3))
880 IF A>0 THEN 900
890 FOR C=1 TO 200:GOSUB 1000:NEXT:GOTO 1130
900 S=0:FOR B=1 TO 3:FOR D=1 TO N(B)
910 X=N(1):Y=N(2):Z=N(3)
920 IF B=1 THEN X=X-D
930 IF B=2 THEN Y=Y-D
940 IF B=3 THEN Z=Z-D
950 A=X:A=FNX(Y):A=FNX(Z)
960 IF A=0 THEN S=S+1:S(S,0)=B:S(S,1)=D
970 NEXT D,B
980 S=INT(RND(1)*S+1):R=S(S,0)-1:N=S(S,1)
990 FOR C=1 TO 200:GOSUB 1000:NEXT:GOTO 1160
1000 V=V+1 AND 7:IF V THEN RETURN
1010 Y=INT(RND(1)*3+1):X=INT(RND(1)*N(Y)+1)
1020 IF N(Y)=0 THEN 1000
1030 H=INT(RND(1)*5+1)
1040 FOR A=0 TO 1:SCREEN 52-5*X-5*Y,5*Y+A-4
1050 PRINT H$(H,A);:NEXT
1060 IF H<5 THEN DOKE USER,KEY:RETURN
1070 L=INT(RND(1)*8+1):POKE 3220,3
1080 DOKE USER,SOUND:BF=13*256:FOR D=1 TO L
1090 POKE BF,RND(1)*20+20:POKE BF+1,2
```

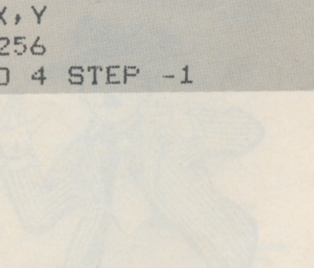






```
1100 POKE BF+2,0:Z=USR(0)
1110 FOR A=1 TO RND(1)*20+15:NEXT
1120 NEXT:H=0:POKE 3220,2:GOTO 1040
1130 X=0:FOR A=1 TO 3:IF N(A)>X THEN X=A
1140 IF N(A)=X AND RND(1)>.5 THEN X=A
1150 NEXT:R=X-1:N=1
1160 GOSUB 1300:GOSUB 1440
1170 IF N(1)+N(2)+N(3) THEN 700
1180 SCREEN 15,7:PRINT "I'VE BEATEN YOU!!!!"
1190 FOR A=1 TO 8:Z=USR(0):NEXT
1200 GOTO 1250
1210 SCREEN 15,7:PRINT "YOU'VE BEATEN ME!!!!"
1220 FOR A=1 TO 256:OUT 4,A AND 1:NEXT
1230 DOKE USER,KEY
1240 A=USR(0):IF A=ASC("Y") THEN GOTO
1250 SCREEN 15,9:PRINT "Another game ?(Y or N)"
1260 DOKE USER,KEY
1270 A=USR(0):IF A=ASC("Y") THEN 560
1280 IF A<>ASC("N") THEN 1270
1290 GOTO 2070
1300 H=2:GOSUB 1410:FOR A=1 TO 300:NEXT
1310 H=0:GOSUB 1410:FOR A=1 TO 300:NEXT
1320 IF N(R+1)<N THEN 1370
1330 RESTORE 1360
1340 FOR B=1 TO 8:READ H:GOSUB 1410:NEXT
1350 F=1:RETURN
1360 DATA 4,0,3,0,4,0,3,0
1370 RESTORE 1400
1380 FOR B=1 TO 8:READ H:GOSUB 1410:NEXT
1390 F=0:RETURN
1400 DATA 1,0,2,0,1,0,2,0
1410 FOR A=0 TO 1:SCREEN 1,R*5+A+1
1420 PRINT H$(H,A);:NEXT A
1430 FOR A=1 TO 75:NEXT:RETURN
1440 H=2:GOSUB 1410:FOR A=1 TO 1000:NEXT
1450 FOR A=0 TO 3:X1=A1(A,0):Y1=A1(A,1)+R*15
1460 X2=A2(A,0):Y2=A2(A,1)+R*15
1470 SET(X2,Y2):RESET(X1,Y1)
1480 NEXT:GP=VDU+7+320*R+128:POKE GP,ASC("=")
1490 FOR A=1 TO 1000:NEXT
1500 FOR Y=3 TO 1 STEP -1:IF N(Y)>0 THEN 1520
1510 NEXT Y:GOTO 1580
1520 FOR X=1 TO N(Y)
1530 FOR A=0 TO 1:SCREEN 52-5*X-5*Y,5*Y-5+A+1
1540 IF Y>R+1 THEN H=3
1550 IF Y=R+1 THEN H=1
1560 IF Y<R+1 THEN H=4
1570 PRINT H$(H,A);:NEXT A,X,Y
1580 DOKE USER,SOUND:BF=13*256
1590 POKE BF+2,0:FOR A=32 TO 4 STEP -1
```





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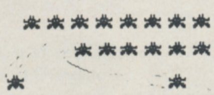

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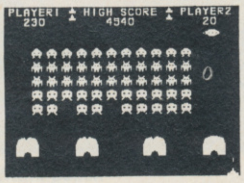

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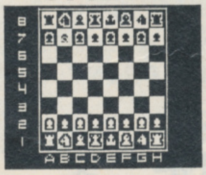

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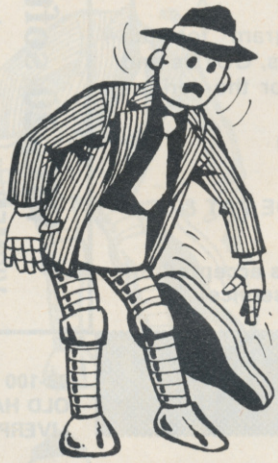
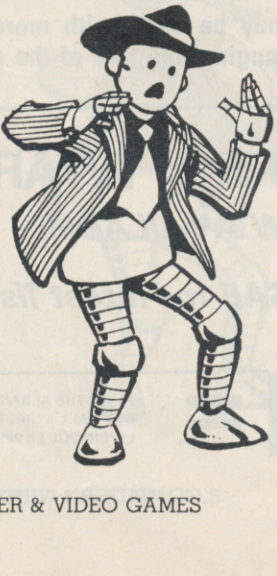
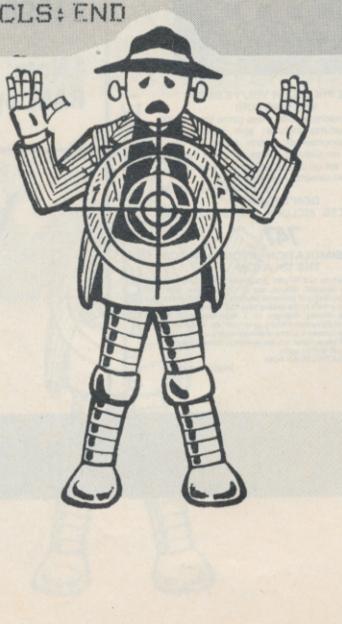


```
1600 POKE BF,A:POKE BF+1,128/A AND 255
1610 POKE GP,ASC("-"):Z=USR(0):POKE GP,ASC("=")
1620 FOR B=1 TO 20:NEXT B,A
1630 FOR S=1 TO N:BF=13*256
1640 POKE BF+1,50:POKE BF,2:POKE BF+2,0
1650 FOR A=1 TO 40:IF PEEK(GP+A)>32 THEN 1670
1660 POKE GP+A,ASC("-"):Z=USR(0):NEXT:STOP
1670 FOR B=0 TO 4:X=47-5*N(R+1)-5*R:Y=R*5+B+1
1680 SCREEN X,Y:PRINT D$;:NEXT B
1690 BF=13*256:FOR C=20 TO 1 STEP -1:
1700 POKE BF,C:POKE BF+1,50/C:BF=BF+2:NEXT
1710 DOKE BF,0:Z=USR(0)
1720 FOR B=0 TO 4:X=47-5*N(R+1)-5*R:Y=R*5+B+1
1730 SCREEN X,Y:PRINT S$;:NEXT B
1740 FOR B=1 TO A:POKE GP+B,32:NEXT
1750 N(R+1)=N(R+1)-1:NEXT S:POKE GP,32
1760 FOR A=1 TO 1000:NEXT
1770 FOR A=3 TO 0 STEP -1:X1=A1(A,0)
1780 Y1=A1(A,1)+R*15:X2=A2(A,0):Y2=A2(A,1)+R*15
1790 RESET(X2,Y2):SET(X1,Y1):NEXT
1800 H=0:GOTO 1410
1810 GOTO 1810
1820 SCREEN 10,7
1830 PRINT "                                          "
1840 FOR Y=3 TO 1 STEP -1:FOR X=1 TO N(Y)
1850 FOR A=0 TO 4:SCREEN 52-5*X-5*Y,5*Y-5+A+1
1860 PRINT A$(A);:NEXT A,X,Y:RETURN
1870 CLS:PRINT "This is like the 7,5,3 match";
1880 PRINT "sticks game."
1890 PRINT "It consists of 3 rows of robots."
1900 PRINT "The object is to shoot the last ";
1910 PRINT "robot."
1920 PRINT "You choose how many to shoot from";
1930 PRINT "any row by"
1940 PRINT "typing the row number (1,2 or 3)"
1950 PRINT "then how many to shoot from that ";
1960 PRINT "row."
1970 PRINT
1980 PRINT "There is a test tone on bit 0, ";
1990 PRINT "port 4 "
2000 PRINT
2010 SCREEN 1,10
2020 PRINT "              Press space to continue"
2030 A=USR(0):IF A=32 THEN RETURN
2040 B=B+1 AND 63:IF B AND 32 THEN 2060
2050 OUT 4,1-INP(4):GOTO 2010
2060 SCREEN 1,10:PRINT CHR$(27);:GOTO 2030
2070 CLS:END
Ok
```





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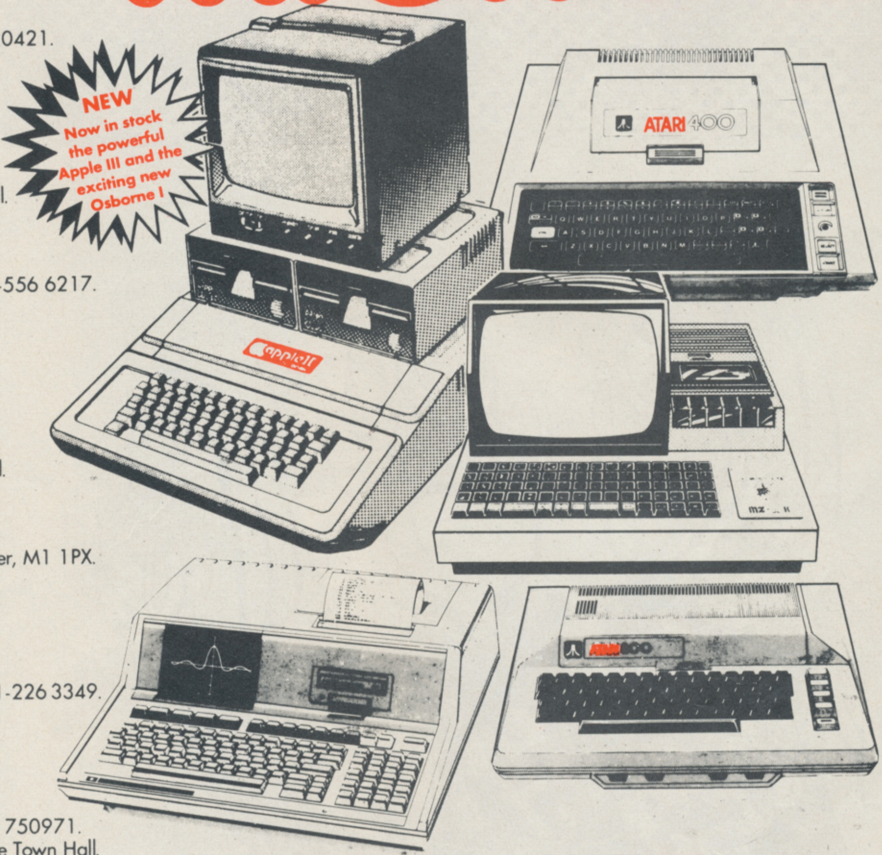

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ALIE HUN

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In the game you are the dominant life-form and the poor alien is on the run.

It makes a nice change for the humans to be able to win so make the most of it.

The aim of this Acorn Atom game is to trap the alien in the top left hand corner of the screen by cutting his escape routes off by drawing lines around him.

If you miss your objective and mistakenly trap him elsewhere, penalty points are accrued. The aim is to get as low a score as possible.

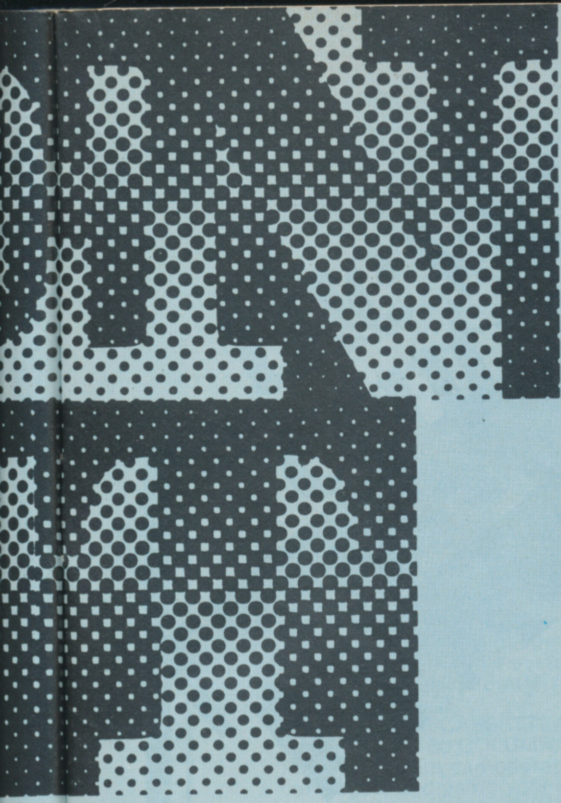
Your efforts are scored, commented upon and a new game is automatically restarted.

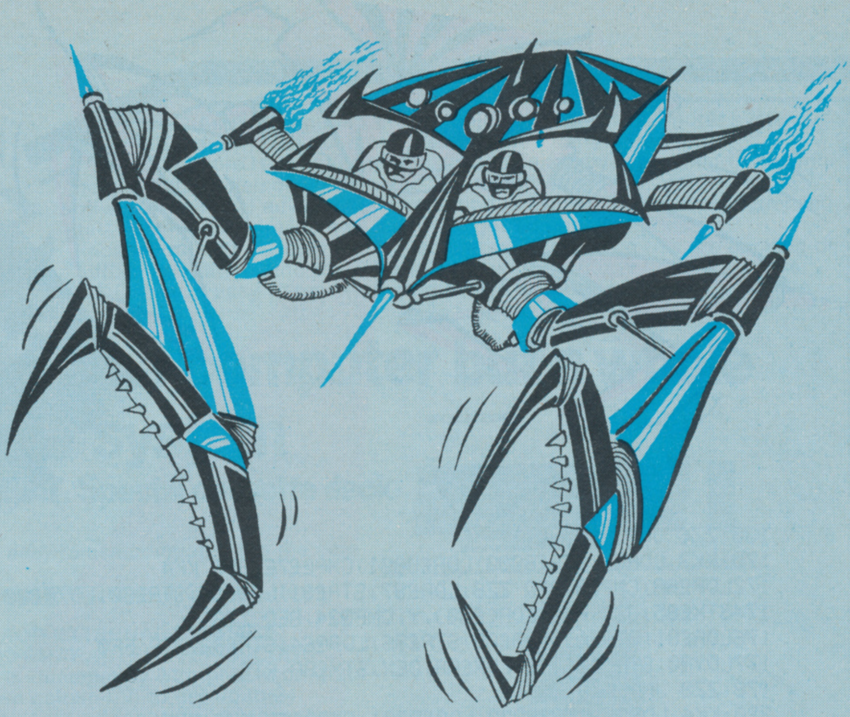
The alien emits a squeal through the Atom speaker when trapped or crushed.

Due to the printer used not having a hash (#) symbol, a "£" sign has been substituted. This should be turned into a hash sign wherever it crops up.

No graphic modes are used and the game is written, mainly in machine code, so it only takes up 4.3K on the computer.

Line 17 will be of interest to Atom users as it is a routine which waits for the frame sync pulse to go low, before POKE-ing to the screen, thus avoiding the usual Atom screen noise.





```
 1GOS.c
 10DIM FF0,KK9,MM0,PP0,ZZ15,SS5
 11P.$12;M=24;MM0=-1;PP0=-1;KK8=-1;T=£B002
 12F.N=1TO 2;DIM P-1;P.$21
 16[
 17:FF0 LDA@128;BIT£B002;BNE FF0;LDA£82;RTS
 20:KK0 LDA@3;STA£B000;LDA£B001;CMP@£FE;BNE KK1
 22LDA£AA;CMP@13;BEQ ZZ2;LDA£87;STA£81;LDA£86;STA£80
 24LDY@0;LDX@£20;STX£85;JSR MM0;LDY@0;LDA(£80),Y;CMP@24;BEQ ZZ2
 26LDA£81;STA£87;LDA£80;STA£86;LDA@127;STA£82;JSR FF0
 27STA(£86),Y
 28LDX£AA;INX;STX£AA;RTS
 30:ZZ2 JMP KK8
 70:KK1 LDA@3;STA£B000;LDA£B001;CMP@£7E;BNE KK2
 72LDA£AA;CMP@13;BEQ ZZ2
 74LDA£87;STA£81;LDA£86;STA£80;LDX@£20;STX£85;JSR MM0
 76LDY@0;LDA(£80),Y;CMP@24;BEQ ZZ4;LDA£81;STA£87;LDA£80;STA£86
 78LDA@64;STA£82;JSR FF0;STA(£86),Y;LDX£AA;INX;STX£AA;RTS
 80:ZZ4 JMP KK8
120:KK2 LDA@2;STA£B000;LDA£B001;CMP@£FE;BNE KK3
122LDA£AA;CMP@0;BEQ ZZ6;LDA£87;STA£81;LDA£86;STA£80;LDX@£20
124LDY@0;STX£85;JSR PP0;LDA(£80),Y;CMP@24;BEQ ZZ6
126LDA£81;STA£87;LDA£80;STA£86;LDA@127;STA£82;JSR FF0
127STA(£86),Y;LDX£AA;DEX;STX£AA;RTS
```

Runs on an Acorn Atom in 4.5K

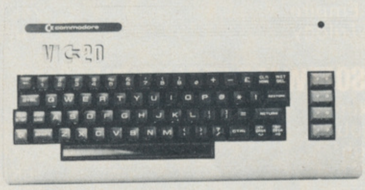
By John Kirk

```
130:ZZ6 JMP KK8
170:KK3 LDA@2;STA£B000;LDA£B001;CMP@£7E;BNE KK4
172LDA£AA;CMP@0;BEQ ZZ6;LDA£87;STA£81;LDA£86;STA£80;LDX@£20
174STX£85;JSR PP0;LDA(£80),Y;CMP@24;BEQ ZZ8
176LDA£81;STA£87;LDA£80;STA£86;LDA@64;STA£82;JSR FF0
177LDY@0;STA(£86),Y;LDX£AA;DEX;STX£AA;RTS
178:ZZ8 JMP KK8
220:KK4 LDA@6;STA£B000;LDA£B001;CMP@£FE;BNE KK5
222LDA£90;CMP@1;BEQ ZZ10;LDA£87;STA£81;LDA£86;STA£80;LDX@1
224STX£85;JSR MM0;LDY@0;LDA(£80),Y;CMP@24;BEQ ZZ10
226LDA£81;STA£87;LDA£80;STA£86;LDA@127;STA£82;JSR FF0
228LDY@0;STA(£86),Y;LDX£90;DEX;STX£90;RTS
230:ZZ10 JMP KK8
270:KK5 LDA@6;STA£B000;LDA£B001;CMP@£7E;BNE KK6
272LDA£90;CMP@1;BEQ ZZ12;LDA£87;STA£81;LDA£86;STA£80;LDX@1
274STX£85;JSR MM0;LDY@0;LDA(£80),Y;CMP@24;BEQ ZZ12;LDA£81
275STA£87
276LDA£80;STA£86;LDA@64;STA£82;JSR FF0;STA(£86),Y;LDX£90
278DEX;STX£90;RTS
300:ZZ12 JMP KK8
320:KK6 LDA@6;STA£B000;LDA£B001;CMP@£FD;BNE KK7
321LDY@0
322LDA£90;CMP@30;BEQ ZZ13;LDA£87;STA£81;LDA£86;STA£80;LDX@1
324STX£85;JSR PP0;LDA(£80),Y;CMP@24;BEQ ZZ13;LDA£81;STA£87
330LDA£80;STA£86;LDA@127;STA£82;JSR FF0;STA(£86),Y
335LDX£90;INX;STX£90;RTS
340:ZZ13 JMP KK8
370:KK7 LDA@6;STA£B000;LDA£B001;CMP@£7D;BNE KK8
372LDA£90;CMP@30;BEQ KK8;LDA£87;STA£81;LDA£86;STA£80
373LDY@0;LDX@1
374STX£85;JSR PP0;LDA(£80),Y;CMP@24;BEQ KK8;LDA£81;STA£87
376LDA£80;STA£86;LDA@64;STA£82;JSR FF0;STA(£86),Y
378LDX£90;INX;STX£90;RTS
420:KK8 RTS
1300:MM0 SEC;LDA£80;SBC£85;STA£80;LDA£81;SBC@0;STA£81;RTS
1310:PP0 CLC;LDA£80;ADC£85;STA£80;LDA£81;ADC@0;STA£81;RTS
1311:SS0 STY£83
1312:SS1 LDA T;LDY£84
1313:SS2 LDX£85
1314:SS3 DEX;BNE SS3;EOR @4;STA T;DEY;BNE SS2;LDY £83;RTS
1318]
1319N.N;P.$6
1320CLEAR 0;S=0
1321F.N=32768TO32799;LINK FF0;?N=127;N.N
1322F.N=33248TO33279;LINK FF0;?N=127;N.N
1323F.N=32800TO33216 STEP32;LINK FF0;?N=127;N.N
1324F.N=32831TO33247 STEP 32;LINK FF0;?N=127;N.N
1330?£86=£8F;?£87=£81
1332?£AA=2;?£90=15
1333F.N=1TO26;?£818F=£2A;LINK FF0;?£8021=£3C;?£8022=£2D;LINKFF0
1334?£8023=£2D;?£8024=£14;?£8025=£12;?£8026=£01;?£8027=£10
1335LINK FF0;?£818F=127;WAIT;?£818F=£2B;F.G=£8021TO£8027;?G=64
1336N.G;LINK FF0;N.N;?£818F=127
1339X=A.R.%(33278-33088)+33088
1340IF?X<>£40 G.1339
```

the vic centre

Adda Computers Ltd., a major supplier of computer systems to industry and business, have opened the Vic Centre in West London. Here you can see, discuss and buy everything to do with the new VIC 20 personal computer—in person or by mail. Hardware, software, technical advice and information is available from an experienced staff. Even if you already own a VIC 20, get on our mailing list to know about new developments. Remember—everything has the backing of Adda's reputation, and there's a full 12-month warranty on all hardware. The Vic Centre is easy to reach—Just off the A40, close to North Acton tube station.

Not just a computer but a whole expandable system



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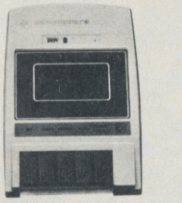
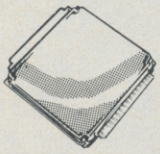
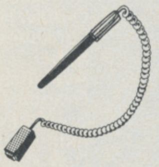


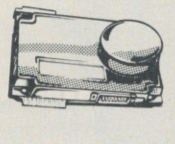
VIC-MEMORY 3K **£44.85**
Small size—low cost memory expansion. Plugs into Vic and reproduces memory-port. Can be used with other expansions gives a total of 6k user static ramon Vic.
FEATURE This board allows Vic to move Basic to begin at 1024 ($0400) as in Pet, and enables the use of HIGH RESOLUTION COLOUR GRAPHICS



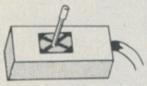
VIC-LIGHT PEN **£28.75**
This high quality light pen works in both normal and Hi-Res modes on the Vic allowing simple interaction with the Vic without keyboard entry.
Easy to program and easy to use.
e.g. Menu selection. Non-keyboard entry. Teaching Games.
FEATURE touch sensitive "Enter" contacts to eliminate accidental entry.



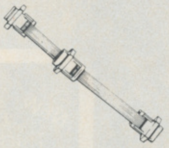
VIC-RS232 INTERFACE **£56.35**
Fully implemented (true levels)
RS232C-V24
BI-DIRECTIONAL INTERFACE
Allows Vic to work as Mainframe Terminal Drive a Qume Daisywheel or a Paper Tape Punch etc. etc.
FEATURE This unit contains master power supply which supports Vic's own supply when carrying Memory Expansions, Cassette Drives, Light Pens, Printers etc.



VIC JOYSTICK Single **£14.95**
Hand-Held joystick units for games use available in Pair or Single configuration.
N.B. (2 Singles will not work as a pair unless modified)



VIC-Games Port Adaptor Cable **£19.85**
A two into one adaptor for use with both joysticks and light pens. A must for those who require full control of games with graphics.
FEATURE low-cost High quality. Robust



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```
 1370?X=M
 1375GOS.r
 1377IF ?(X+D)<>£40 G.1375
 1379?X=64;LINK FF0;?(X+D)=M;X=(X+D);S=S+1
 1380LINK KK0
 1390IF X=£8021 AND ?£8022=127 AND ?£8041=127 G.10000
 1400IF?(X+1)=127AND?(X-1)=127AND?(X-£20)=127AND?(X+£20)=127G.1
 2005G.1375
 3000rA=(A.R.%4)+1
 3001IF A=1 D=-32;R.
 3002IF A=2 D=32; R.
 3003IF A=3 D=-1;R.
 3004IF A=4 D=1;R.
10000F.N=1TO40;?£83=66;?£84=66;LINK SS0
10020?£84=32;?£83=32;LINK SS0;N.N
11000P.$12;P."THE ALIEN IS IN THE TRAP!!!"
15030F.N=1TO80;WAIT;N.N
18948P.$12;P."YOUR SCORE IS..."S'''''
18958GOS.v;G.1320
20001lF.A=1TO39;LINK FF0;?X=63;LINK FF0;?X=24;N.A
20002P.$12;P."YOUR SCORE IS  "S+2985 "!!!!"''
20003F=100;D=100
20004F.O=1TO44;?£84=D;?£85=F;LINK SS0;D=D-2;F=F-1;N.O
20005F.I=1TO44;?£84=D;?£85=F;LINK SS0;D=D+2;F=F+1;N.I;P.$7
20006P."YOU'VE CRUSHED"'
20007P."THE ALIEN !!"''';?£E1=0
20010F.N=1TO093;WAIT;N.N;G.1320
32000cP.$12;P."*******alien traP *******"'
32101P."TRAP THE""ALIEN""IN THE TOP"'
32102P."L.H. CORNER OF THE SCREEN"'
32103P."USING THE FOLLOWING KEYS:"''`
32104P."] ..............IS FOR LEFT"''
32105P."RETURN ........IS FOR RIGHT"''
32106P."UP/DOWN ARROW..IS FOR  DOWN"''
32107P."AND L/R ARROW.....IS FOR UP"'';F.J=1TO5;GOS.b;N.J
32108P."[USE ""SHIFTED""KEYS TO ERASE]"'';F.N=1TO10;GOS.b;N.N
32109P."Press shift to continue"
32110DO WAIT;U.?£B001<>£FF
32111F.N=£8000TO£81FF;?N=32;N.N;R.
32112bF.N=1TO 60;WAIT;N.N;R.
32120v?£E1=0;IF S<=100 P."    EXCELLENT";G.32130
32121 IF S<=175 P."VERY GOOD";G.32130
32122IF S<=210 P."GOOD";G.32130
32123IF S<=245P."AVERAGE";G.32130
32124IF S<=300 P."POOR";G.32130
32125IF S<=400P."BAD";G.32130
32126IF S<=500 P."VERY BAD";G.32130
32130GOS.b;R.
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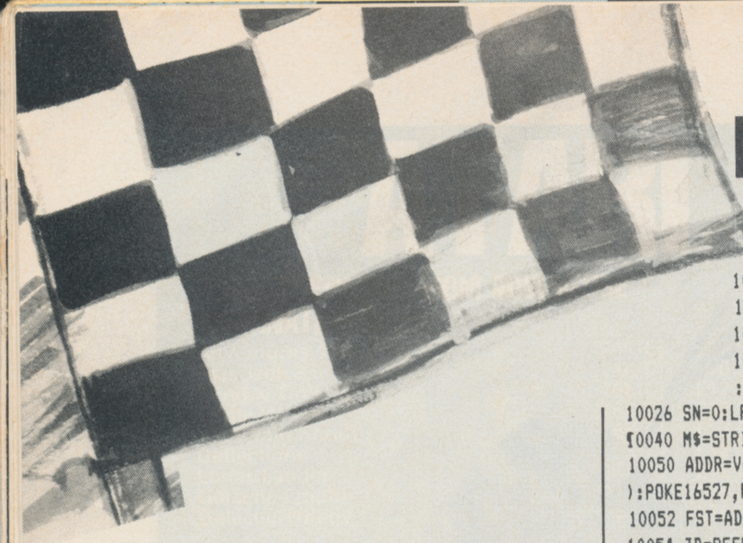


RUNS ON A TANDY TRS-80 IN 16K

BY MAX CHAUVET

To reach the final of a Grand Prix race you must first experience a gruelling qualifying round in which speed alone counts.

You control a Formula One car, aiming to complete one lap of the international race track in the shortest possible time. The car travels at top speed on the straight sections of the circuit, but you must steer it round the corners, some of them sharp bends.

When the car is steered to the right or left it automatically slows down so a good tactic to employ is to manoeuvre the car as little as possible to keep at the highest speed you can without crashing.

If your steering fails you then you end up off the track and crash into the rails. Don't despair if that happens, you find the seconds will tick quickly away building up your final lap time, but you don't have to start the lap again.

You will need a TRS-80 Level II with 16K memory to run this program.

To control the car you use the arrow keys to turn the steering wheel to right or left, but those are all you can use. There is no accelerator or brake for you to take advantage of, you have to rely on your steering to see you through. Be careful not to keep one of the arrow keys depressed because if you do the car will continue turning.

An extra feature written into this program comes near the end of the lap. When you near the finish line the lap record (time for you to beat) is displayed on the left of the screen, while on the right hand side of the screen your own lap time is shown to see if an extra spurt of speed is needed.

```
10000 ' GRAND PRIX RACING
10010 ' 1980. M.CHAUVET
10020 CLEAR500:DEFINTA-Y:CLS
10025 RPS=0:R0=0:RD=0:EC=0:B=0:KB=0:LC=0:RC=0:TW=2:Z=0:T=0:QZ=17
:UN=1:NL=128
10026 SN=0:LP=0:DX=10:SC=600:T1=0:T2=0
10040 M$=STRING$(255,0):M0$=STRING$(75,0)
10050 ADDR=VARPTR(M0$):IFPEEK(16396)=201 THENPOKE16526,PEEK(AD+1
):POKE16527,PEEK(AD+2)
10052 FST=AD
10054 ZD=PEEK(AD+1)+PEEK(AD+2)*256
10056 IF ZD>32767 ZD=ZD-65536
10058 AD=ZD
10060 IFPEEK(16396)<>201THEN DEFUSR0=AD:CMD"T"
10070 CAR=ADDR+182
10080 EC=16: DIM LAP(50)
10090 KBOARD=14400 : TWO=2 : BL=32
10100 B$=STRING$(8,24) : C$=CHR$(26)
10110 A$=STRING$(2,176)+LEFT$(B$,4)+C$+"#-"+STRING$(2,191)+"-#"+
      LEFT$(B$,5)+C$+CHR$(170)+CHR$(93)+CHR$(94)+CHR$(149)+LEFT$
      (B$,6)+C$+"##-"+STRING$(2,191)+"-##"+LEFT$(B$,5)+C$+CHR$
      (34)+CHR$(34)
10200 ' SCROLLING ROUTINE
10210 DATA CD7F0A7D00018E40C5FD21BD00FD09DD21B600DD092600DD6E000
1
10220 DATA 003C09C1B72802FDE9114003E519E5D101400009EB0E10ED
10230 DATA B0110003E1E519E5D101400009EB0E38EDB011BF02E1E519E5D1
10240 DATA 01400009EB0E39EDB0117F02E1E519E5D101400009EB0E3AEDB0
10250 DATA 113D02E1E519E5D101400009EB0E3CEDB011EE02FDE1FDE5FD19
10260 DATA FD7E00FD7710FD7E01FD7711FD7E18FD7708FD7E19FD7709113A
10270 DATA 022600DD6E0019E5FDE1E119E5D101400009EBFDE5C1EDB83E00
10280 DATA C90000000000000
10290 '  MOVE CAR
10300 DATA DD213101DD093D20313E05117C0219E5D11313E50600DD4E00EDB
823E5FDE1FD4610
10310 DATA FD7000FD4611FD7001E13DC80600DD4E0109DD23DD2318D53E051
10A00DD19117B02
10320 DATA 19E5D11B1BE50600DD4E00EDB0011200ED42E5FDE1FD4600FD701
0FD
10330 DATA 4601FD7011E13DC80600DD4E0109DD23DD2318D1
10340 DATA 0242063F044208400500
10350 DATA 023E0641043E08400500
10360 DATA END
10370 READ D$ : IF D$="END" THEN 10440 ELSE GOSUB 15000
10380 FORI=1TOLEN(D$)STEP2
10390 D=ASC(MID$(D$,I,1)):D1=ASC(MID$(D$,I+1,1))
10400 IFD>57THEND=D-7
10410 IFD1>57THEND1=D1-7
10420 D=(D-48)*16+D1-48 : POKE ADDR,D : AD=AD+1
10430 NEXT I : GOTO 10370
10440 DATA 0,1,1,2,3,3,2,1,1,0
10450 FORI=1TO10:READC(I):NEXTI
10460 POKE ZD+6,PEEK(FST+1)
10470 POKE ZD+7,PEEK(FST+2)
10500 '  CIRCUIT SET UP
10510 TM=30+RND(20): TB=TM*10.1: TK=TM-5: TL=TM-1: CN=0
10520 FOR I=2 TO TM-2: DIR=RND(3)-2:CN=CN+DIR:IFABS(CN)>1THENCN=
CN-2*DIR:DIR=-DIR
10524 IF PRV=0 PRV=DIR
10526 IF DIR THEN IF DIR=PRV THEN TB=TB+14:PRV=DIR ELSE TB=TB+6:
PRV=DIR
10530 LAP(I)=DIR:NEXTI
10540 LAP(1)=0:LAP(TM)=0:LAP(TM-1)=0:CLS
10542 PRINT@466,"THE CIRCUIT IS ";:PRINTUSING"#.## MILES LONG";T
M/20;
10545 PRINT@530,"THE LAP RECORD IS ";:T1=TB/600:T2=TB-T1*600:PRI
```

GRAND PRIX

```
NTUSING"##:##.#";T1,T2/10;:TB$=""
10547 FORI=548TO554:TB$=TB$+CHR$(PEEK(15360+I)):NEXT
10548 ME$=TB$:M=548:GOSUB21000:FORI=1TO200:NEXTI:CLS
10550 CH$=CHR$(28)+CHR$(255)
10570 CLS: PRINT@671,A$;
10580 POKE CAR,36: RCRASH=15360+733+EC+1: LCRASH=RC+5-2*EC-1
10590 RPS=15384: ROAD=132: RD=13
10600 FOR LP=1 TO TM
10610 SN=LAP(LP): IF SN THEN RO=132:RD=0 ELSE RD=13
10620 FORI=1TO10:RPS=RPS+C(I)*SN:Z=USR(0):PRINTCH$;:POKE RPS,RO:
POKE RPS+EC,RO:RO=RO+RD:RD=-RD: B1=B:B=PEEK(KB):IF SN POKE RPS-U
N,NL:POKE RPS+QZ,NL
10625 IFB=0THEN10800
10630 T=T+2 :IFB=32THEN10700
10650 Z=USR(1):POKE CAR,PEEK(CAR)+TWO:LC=LC+TWO:RC=RC+TWO:GOTO10
710
10700 Z=USR(2):POKE CAR,PEEK(CAR)-TWO:LC=LC-TWO:RC=RC-TWO
10710 IFB1>0THENIFB1<>BTHEN12000
10800 IFPEEK(LC)=BLANDPEEK(LC-1)=BL AND PEEK(RC)=BLANDPEEK(RC+1)
=BL GOTO11000
10810 T=T+20: IF PEEK(LC)<>BLORPEEK(LC-1)<>BLTHEN LEFT=0 ELSE LE
FT=-1
10812 L1=PEEK(CAR)+640: IF LEFT THEN L1=L1-17
10815 PRINT@L1," *CRASH*";
10820 IF NOT(LEFT) THEN GOSUB20000:GOSUB20010:GOSUB20000:GOSUB20
000 ELSE GOSUB20010:GOSUB20000:GOSUB20010:GOSUB20010
```

```
10830 FORL=1TO50:NEXTL
10850 PRINT@L1,CHR$(201);
11000 NEXTI
11010 T=T+DX: IFLP<TKTHEN11200
11020 T1=T/SC:T2=T-T1*SC:PRINT@965,TB$;:PRINT@1010,;:PRINTUSING"
##:##.#";T1,T2/DX;
11030 IFLP=TLTHENPRINT@RPS-15360,STRING$(5,153)"FINISH"STRING$(5
,166);
11200 NEXT LP
11205 FORI=1TO10:PRINT@0,CHR$(255);:Z=USR(0):NEXTI
11210 IFT<TB THEN ME$="YOU BROKE THE LAP RECORD !":M=470:GOSUB21
000:GOTO11280
11220 IFT-TB>200 PRINT@464,"YOUR DRIVER'S LICENCE HAS BEEN CANCE
LLED!":GOTO11280
11230 IFT-TB>100 PRINT@464,"PERHAPS YOU NEED A WIDER TRACK":GOTO
11280
11240 PRINT@464,"YOU'VE QUALIFIED IN ";
11250 PLACE=INT((T-TB)/5)+1:IFPL=1THENPRINT"1ST";ELSEIFPL=2THENP
RINT"2ND";ELSEIFPL=3THENPRINT"3RD";ELSEPRINTPLACE"TH";
11260 PRINT" PLACE";
11280 T=0
11290 FORI=1TO1000:NEXTI
11300 PRINT@528,CHR$(31);"HIT ENTER TO TRY AGAIN OR"
11305 PRINT@592,"X  TO MOVE TO ANOTHER CIRCUIT";
11310 Y$=INKEY$:IFY$=CHR$(13)THEN10570ELSEIFY$="X"THEN10500ELSE1
1310
12000 IF B=32 THEN L1=LC-15360-6:LEFT=-1 ELSE L1=RC-15360+1:LEFT
=0
12005 L1=570+PEEK(CAR)
12010 PRINT@L1,"OOOPS!";: FORL=1TO50:NEXTL: PRINT@L1,CHR$(198);
12020 IF LEFT THEN12500
12030 IFPEEK(LC)<>BLORPEEK(LC-1)<>BLTHEN12600
12040 GOSUB20010:GOTO12030
12500 IFPEEK(RC)<>BLORPEEK(RC+1)<>BLTHEN12600
12510 GOSUB20000:GOTO12500
12600 T=T+10
12620 GOTO10812
15000 PART=PART+1:IFINT(PART/2)*2<>PART RETURN
15050 ONPART/2GOTO16000,16025,16030,16040,16050,16070
15060 RETURN
16000 PRINT@25,"** GRAND PRIX **"
16010 PRINT@192,"YOU ARE ABOUT TO TAKE PART IN THE QUALIFYING SE
SSION"
16020 PRINT"OF AN INTERNATIONAL GRAND PRIX RACE."
16022 RETURN
16025 PRINT"YOUR 'FORMULA ONE' CAR IS CONTROLLED BY THE ARROW KE
YS "CHR$(93)" AND "CHR$(94)
16027 RETURN
16030 PRINT"YOU WILL TRY TO TURN IN THE FASTEST LAP KEEPING IN M
IND THAT :"
16035 RETURN
16040 PRINT"     - EVERY TIME YOU STEER YOU LOOSE 2/10 OF A SECO
ND"
16042 PRINT"       SO YOU SHOULD DRIVE CLOSE TO EDGE OF THE TRAC
K."
16045 RETURN
16050 PRINT"     - IF YOU LEAVE THE TRACK YOU'LL BOUNCE BACK IN
AND"
16060 PRINT"       LOOSE 2 SECONDS"
16065 RETURN
16070 PRINT"     - IF YOU CHANGE STEERING DIRECTION TOO SUDDENLY
 YOU"
16080 PRINT"       WILL SKID, LEAVE THE TRACK AND LOOSE 1 SECOND
."
17000 RETURN
20000 Z=USR(2):POKE CAR,PEEK(CAR)-TWO:LC=LC-TWO:RC=RC-TWO
20008 RETURN
20010 Z=USR(1):POKE CAR,PEEK(CAR)+TWO:LC=LC+TWO:RC=RC+TWO
20020 RETURN
21000 FORK=1TO10:PRINT@M,CHR$(192+LEN(ME$));:FORI=1TO50:NEXTI:PR
INT@M,ME$;:FORI=1TO25:NEXTI,K:RETURN
```

RUNS ON A SHARP MZ-80K IN 22K

BY TONY WINDIBANK

The words, "Dr Livingstone, I presume", immortalised reporter Stanley's search for the missing African explorer.

Dr Livingstone is lost in darkest Africa again in this Sharp game but no message has been heard from him for five years. His rescue is your objective in Dr Livingstone, but the African jungle holds many dangers and the porters are a notoriously fickle bunch.

You take the part of journalist Henry Morton Stanley, charged with the job of equipping an expedition to find the great man. To cover expenses you have 150,000 annas which should be used to purchase food, medicine, beads, guns, ammunition and for the hiring of porters.

The dangers include: wild animals, diseases, unfriendly tribes and treacherous rivers.

The variables used in the game are: D = number of porters; F = the number of medical boxes; C = number of annas (an African coin); G = number of boxes of beads; E = food packs; H = number of guns; K = boxes of ammunition.

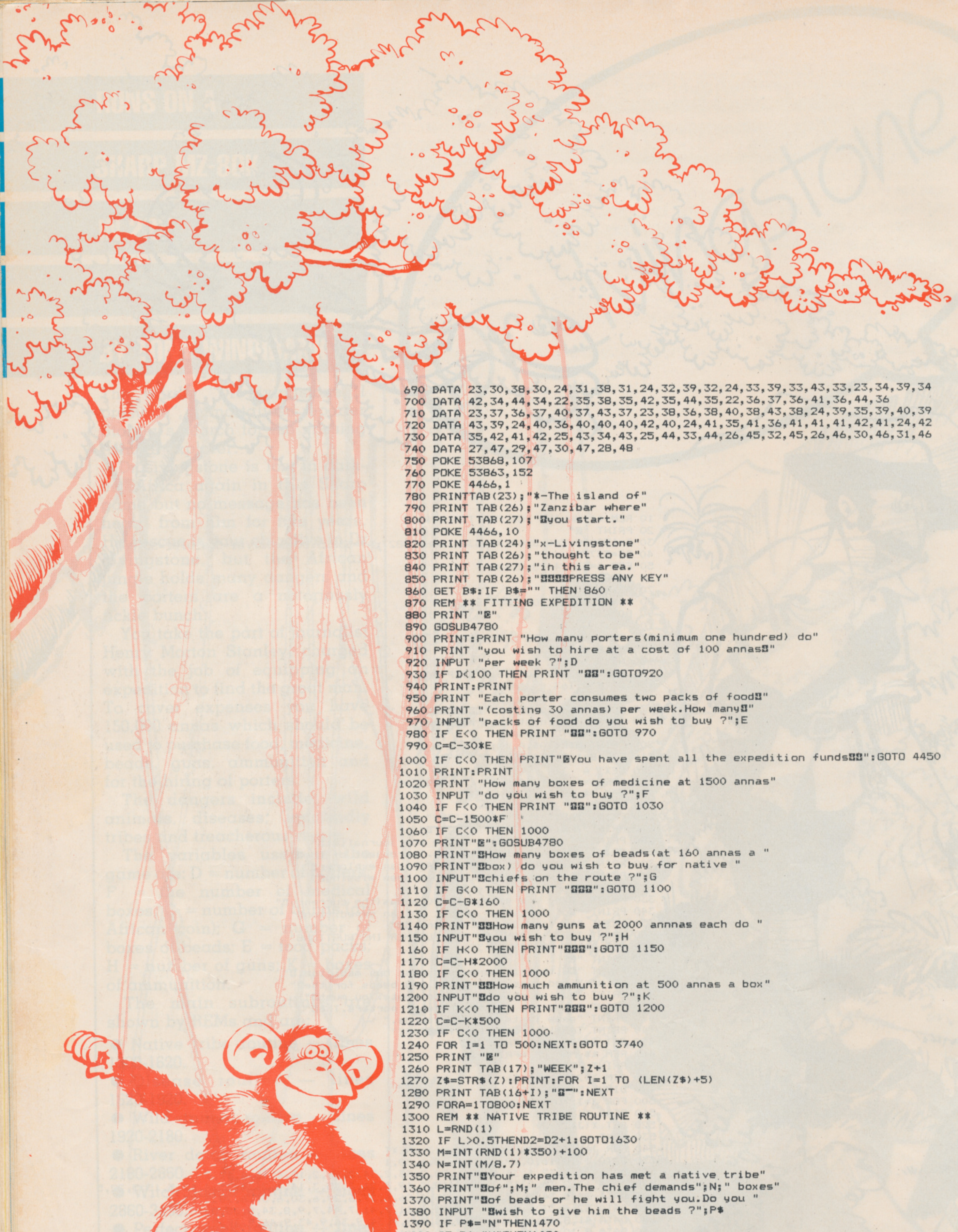
The main subroutines are shown by REMs and are:

- Native tribe routine — lines 1300-1620.
- Disease routine — lines 1620-1920.
- Wild animal routine — lines 1920-2180.
- River delay routine — lines 2180-2860.
- Witch doctor routine — lines 2860-3490.
- Perfect week routine — lines 3490-3580.

The game can be made harder by making the minimum number of porters 150 and altering lines 900 and 930.

Dr Livingstone..

```
10 REM ** MAKING BOX FOR TITLE **
20 PRINT "▩"
30 C=150000:Z=0:D2=0:A7=53831:A8=53827:A9=53825:B0=53822:B1=53820:B2=53780
40 B3=53775
50 FOR A=53574 TO 53602
60 POKE A,163
70 NEXT
80 FOR A=53642 TO 53801 STEP 40
90 POKE A,163
100 NEXT
110 FOR A=53802 TO 53774 STEP-1
120 POKE A,163
130 NEXT
140 FOR A=53734 TO 53614 STEP-40
150 POKE A,163
160 NEXT
170 POKE 4466,10:PRINT "▩▩▩▩▩▩▩▩";
180 A$="Dr.Livingstone,I presume?"
190 FOR A=1 TO LEN(A$)
200 PRINT MID$(A$,A,1);
210 FOR B=1 TO 50:NEXT B
220 NEXT A
230 FOR A=1 TO 1000:NEXT
240 REM ** INSTRUCTIONS **
250 PRINT "▩"
260 PRINT TAB(14);"INSTRUCTIONS"
270 PRINT TAB(14);"────────────▩"
280 PRINT "In this game,you are the journalist▩"
290 PRINT "Henry Morton Stanley.The object of the▩"
300 PRINT "game is to find the African explorer▩"
310 PRINT "Dr.Livingstone,who has been missing▩"
320 PRINT "for five years.▩"
330 PRINT "▩You are given 150000 annas(the currency▩"
340 PRINT "▩of Zanzibar) to fit out an expedition▩"
350 PRINT "to find Dr.Livingstone.▩▩"
360 PRINT TAB(3);"ANY KEY FOR FURTHER INSTRUCTIONS"
370 GET B$:IF B$=""THEN 370
380 PRINT "▩"
390 PRINT "▩With this money you must buy medicine,▩"
400 PRINT "food,guns,ammunition and beads for the▩"
410 PRINT "native chiefs on your route.You must▩"
420 PRINT "also pay for the hire of porters.The▩"
430 PRINT "game lasts for six rounds."
440 PRINT TAB(12);"▩ANY KEY TO START"
450 GET B$:IF B$=""THEN 450
460 REM ** MAP OF AFRICA **
470 PRINT "▩"
480 DIM X(203),Y(203)
490 DIMV(150),W(150)
500 FOR J=1 TO 203
510 READ X(J),Y(J)
520 SET X(J),Y(J)
530 NEXT
540 FOR J=1 TO 150:READ V(J),W(J):NEXT
550 DATA 11,0,16,0,29,0,10,1,16,1,30,1
560 DATA 31,1,32,1,34,1,35,1,20,2,33,2,34,2,11,2,15,4,16,4,12,3
570 DATA 13,2,14,2,15,2,17,3,18,3,19,3,21,3,35,3,14,4,21,4,35,4,12,5,13,5,22,5
580 DATA 27,5,34,5,12,6,24,6,25,6,26,6,27,6,29,6,30,6,31,6,28,5,23,5
590 DATA 32,6,33,6,34,6,40,6,41,6,11,7,41,7,44,7,9,8,34,8,35,8,10,7
600 DATA 41,8,42,8,44,8,45,8,46,8,9,9,34,9,36,9,43,9,46,9,47,9
610 DATA 8,10,35,10,37,10,47,10,7,11,35,11,37,11,48,11,6,12,36,12,38,12
620 DATA 47,12,5,13,36,13,38,13,47,13,5,14,36,14,39,14,45,14,46,14,5,15,37,15
630 DATA 38,15,40,15,44,15,6,16,39,16,41,16,42,16,43,16,7,17,40,17
640 DATA 7,18,40,18,41,18,42,18,43,18,8,19,44,19,9,20,43,20,9,21,10,21,17,21
650 DATA 43,21,11,22,12,22,15,22,16,22,18,22,19,22,42,22,20,23,21,23,42,23
660 DATA 13,23,14,23
670 DATA 22,24,41,24,21,25,33,25,34,25,39,25,40,25,21,26,33,26,35,26,39,26
680 DATA 21,27,32,27,35,27,38,27,22,28,33,28,34,28,38,28,22,29,38,29
```



```
690 DATA 23,30,38,30,24,31,38,31,24,32,39,32,24,33,39,33,43,33,23,34,39,34
700 DATA 42,34,44,34,22,35,38,35,42,35,44,35,22,36,37,36,41,36,44,36
710 DATA 23,37,36,37,40,37,43,37,23,38,36,38,40,38,43,38,24,39,35,39,40,39
720 DATA 43,39,24,40,36,40,40,40,42,40,24,41,35,41,36,41,41,41,42,41,24,42
730 DATA 35,42,41,42,25,43,34,43,25,44,33,44,26,45,32,45,26,46,30,46,31,46
740 DATA 27,47,29,47,30,47,28,48
750 POKE 53868,107
760 POKE 53863,152
770 POKE 4466,1
780 PRINTTAB(23);"*-The island of"
790 PRINT TAB(26);"Zanzibar where"
800 PRINT TAB(27);"▩you start."
810 POKE 4466,10
820 PRINT TAB(24);"x-Livingstone"
830 PRINT TAB(26);"thought to be"
840 PRINT TAB(27);"in this area."
850 PRINT TAB(26);"▩▩▩▩PRESS ANY KEY"
860 GET B$:IF B$="" THEN 860
870 REM ** FITTING EXPEDITION **
880 PRINT "▣"
890 GOSUB4780
900 PRINT:PRINT "How many porters(minimum one hundred) do"
910 PRINT "you wish to hire at a cost of 100 annas▩"
920 INPUT "per week ?";D
930 IF D<100 THEN PRINT "▩▩":GOTO920
940 PRINT:PRINT
950 PRINT "Each porter consumes two packs of food▩"
960 PRINT "(costing 30 annas) per week.How many▩"
970 INPUT "packs of food do you wish to buy ?";E
980 IF E<0 THEN PRINT "▩▩":GOTO 970
990 C=C-30*E
1000 IF C<0 THEN PRINT"▣You have spent all the expedition funds▩▩":GOTO 4450
1010 PRINT:PRINT
1020 PRINT "How many boxes of medicine at 1500 annas"
1030 INPUT "do you wish to buy ?";F
1040 IF F<0 THEN PRINT "▩▩":GOTO 1030
1050 C=C-1500*F
1060 IF C<0 THEN 1000
1070 PRINT"▣":GOSUB4780
1080 PRINT"▩How many boxes of beads(at 160 annas a "
1090 PRINT"▩box) do you wish to buy for native "
1100 INPUT"▩chiefs on the route ?";G
1110 IF G<0 THEN PRINT "▩▩▩":GOTO 1100
1120 C=C-G*160
1130 IF C<0 THEN 1000
1140 PRINT"▩▩How many guns at 2000 annnas each do "
1150 INPUT"▩you wish to buy ?";H
1160 IF H<0 THEN PRINT"▩▩▩":GOTO 1150
1170 C=C-H*2000
1180 IF C<0 THEN 1000
1190 PRINT"▩▩How much ammunition at 500 annas a box"
1200 INPUT"▩do you wish to buy ?";K
1210 IF K<0 THEN PRINT"▩▩▩":GOTO 1200
1220 C=C-K*500
1230 IF C<0 THEN 1000
1240 FOR I=1 TO 500:NEXT:GOTO 3740
1250 PRINT "▣"
1260 PRINT TAB(17);"WEEK";Z+1
1270 Z$=STR$(Z):PRINT:FOR I=1 TO (LEN(Z$)+5)
1280 PRINT TAB(16+I);"▩‾":NEXT
1290 FORA=1TO800:NEXT
1300 REM ** NATIVE TRIBE ROUTINE **
1310 L=RND(1)
1320 IF L>0.5THEND2=D2+1:GOTO1630
1330 M=INT(RND(1)*350)+100
1340 N=INT(M/8.7)
1350 PRINT"▩Your expedition has met a native tribe"
1360 PRINT"▩of";M;" men.The chief demands";N;" boxes"
1370 PRINT"▩of beads or he will fight you.Do you "
1380 INPUT "▩wish to give him the beads ?";P$
1390 IF P$="N"THEN1470
1400 IF P$="Y"THEN1420
1410 PRINT"▩▩▩":GOTO 1380
1420 G=G-N:IFG<0THENPRINT"▩▩YOU HAVEN'T ENOUGH BEADS,YOU MUST FIGHT"
1430 IF G<0 THEN FOR I=1TO1500:NEXT:GOTO1470
1440 PRINT "▩▩ The chief thanks you and allows you to▩pass."
1450 FOR A=1 TO 3500:NEXT
1460 GOTO 1610
1470 IF H<=0 THEN S=1:GOTO4730
```

```
1480 IF K<=0 THEN S=2:GOTO 4730
1490 IF D<50 THENPRINT"◘◘◘◘You have only";D;" porters left and "
1500 IFD<50THENPRINT"◘your expedition has been overwhelmed by"
1510 IFD<50 THEN PRINT"◘the enemy tribe.":FORA=1TO5000:NEXT:PRINT"▣":GOTO4450
1520 PRINT"◘◘  BATTLE !!! You have defeated the enemy"
1530 P=INT((M*3)/((D-(D/1.3))+4*H)):D=D-P
1540 Q=INT((H/4)+(M/100)):IF Q>K THENQ=K:K=K-Q
1550 R=1+INT(RND(1)*4):IF R>H THENR=H :H=H-R
1560 PRINT"tribe but you have lost";P;" porters.You"
1570 PRINT"◘have also used";Q;" boxes of ammunition"
1580 PRINT"◘and";R;" guns have been stolen.":FORA=1TO1000:NEXT
1590 PRINT"◘◘◘◘◘◘◘◘PRESS ANY KEY TO CONTINUE"
1600 GET B$:IF B$="" THEN 1600
1610 PRINT"▣"
1620 REM ** DISEASE ROUTINE **
1630 T=RND(1)
1640 IF T>0.3 THEN D2=D2+1:GOTO1920
1650 V=INT(RND(1)*4)+1
1660 IF V=1 THEN C$=" cholera":A2=5
1670 IF V=2 THEN C$=" malaria":A2=8
1680 IF V=3 THEN C$=" yellow fever":A2=3
1690 IF V=4 THEN C$=" typhoid":A2=2
1700 PRINT "◘◘◘◘◘◘Your expedition is suffering from an◘"
1710 PRINT "outbreak of";C$;"."
1720 IF F=0 THEN PRINT "◘◘You have no medicine left.Your entire"
1730 IF F=0 THEN PRINT "◘expedition is wiped out!!":FOR A=1TO5000:NEXT
1740 IF F=0 THEN PRINT "▣":GOTO4450
1750 PRINT "◘How many boxes ";
1760 INPUT "of medicine do you wish◘  to use ?";U
1770 IFU>FTHENPRINT"◘◘You have only";F;" boxes of medicine"
1780 IF U>F THEN FOR A=1TO3000:NEXT
1790 IF U>F THEN PRINT "▣":GOTO 1700
1800 IF U<2 THEN PRINT "◘◘Because you refused to give out medicine"
1810 IF U<2 THEN PRINT "to your porters they have all died":FOR A=1TO3000
1820 IFU<2THEN NEXTA:PRINT"▣":GOTO 4450
1830 F=F-U
1840 A3=INT(D/(A2*U))
1850 IF A3=0 THEN PRINT "◘◘◘◘You are a good doctor!! None of your"
1860 IF A3=0 THEN PRINT "◘porters died of ";C$;".":GOTO 1900
1870 PRINT "◘◘◘◘As a result of the out break of "
1880 PRINT "◘◘";C$;" your expedition has lost";A3
1890 PRINT "◘porters."
1900 D=D-A3
1910 FOR A=1 TO 5000:NEXT
1920 REM ** WILD ANIMAL ROUTINE **
1930 PRINT"▣":A4=RND(1)
1940 IF A4>0.6 THEND2=D2+1:GOTO2190
1950 A5=INT(RND(1)*5)+1
1960 IF A5=1 THEN D$="lions"
1970 IF A5=2 THEN D$="leopards"
1980 IF A5=3 THEN D$="elephants"
1990 IF A5=4 THEN D$="tigers"
2000 IF A5=5 THEN D$="a rhinoceros"
2010 PRINT"◘◘◘◘◘Your expedition is being attacked by"
2020 PRINT"◘";D$;".Do you wish to use guns or"
2030 PRINT"◘do you want the porters to use their"
2040 PRINT"◘spears(G or S)?"
2050 GET E$:IF E$=""THEN 2050
2060 IF E$="S" THEN 2110
2070 IF K=0 THEN PRINT"◘◘◘◘You have no ammunition left.The"
2080 IF K=0 THEN PRINT"◘porters must use their spears.":GOTO2110
2090 PRINT"◘◘◘◘Very good.But you used 1 box of"
2100 PRINT"◘ammunition.":FOR A=1 TO 4000:NEXT:K=K-1:GOTO2190
2110 A6=INT(RND(1)*7)+2
2120 D=D-A6
2130 IF D<0 THEN PRINT"◘◘◘◘Your last porter has been killed by"
2140 IF D<0 THEN PRINT"◘";D$;".":FOR A=1 TO 4000:NEXT:PRINT"▣":GOTO4450
2150 PRINT"◘◘◘◘You callous beast!! You sacrificed";A6
2160 PRINT"◘porters in order to save ammunition."
2170 FOR I=1TO3500:NEXT
2180 REM ** RIVER DELAY **
2190 PRINT "▣":B4=RND(1):B5=0:B6=0
2200 IF B4>0.2 THEND2=D2+1:GOTO2830
2210 PRINT "◘◘◘Unfortunately your expedition has"
2220 PRINT "◘gone a bit off course and in front of"
2230 PRINT "◘you is a river full of hungry croc-"
2240 PRINT "◘odiles.You have to build a boat but"
2250 PRINT "◘this means feeding the porters while it"
2260 PRINT "◘is being built.So the choice is as shown"
2270 PRINT TAB(1);"◘Time to Build":PRINT TAB(23);"◘Strength of Boat"
2280 PRINT TAB(1);"────────────────":PRINT TAB(23);"◘─────────────────"
2290 PRINT TAB(3);"◘1 week":PRINT TAB(28);"◘Sturdy"
2300 PRINT TAB(3);"◘3 days":PRINT TAB(25);"◘Rather Flimsy"
2310 PRINT "◘◘◘KEY '1' FOR FIRST CHOICE OTHERWISE '2'"
2320 GET B$:IF B$=""THEN 2320
2330 IFB$="1"THEN 2360
2340 IFB$="2"THEN 2440
2350 GOTO 2320
2360 REM ** B$="1" **
2370 E=E-(D*2)
2380 IF E<0 THEN PRINT"▣":POKE4466,5
2390 IF E<0 THEN PRINT"Your food supply has run out.The"
2400 IF E<0 THEN PRINT"◘porters have rebelled and thrown you"
2410 IFE<0THENPRINT"◘to the crocodiles.":FORA=1TO4500:NEXTA:PRINT"▣":GOTO4450
2420 B5=RND(1)
2430 GOTO 2490
2440 REM ** B$="2" **
2450 E=E-INT(D*1)
2460 IF E<0 THEN 2380
2470 B6=RND(1)
2480 GOTO 2490
2490 REM ** THE CROSSING **
2500 B7=22:B8=1
2510 PRINT "▣"
2520 I$="                 "
2530 X$="    ****** ~ "
```

Name ....
Address ....
Interest ....
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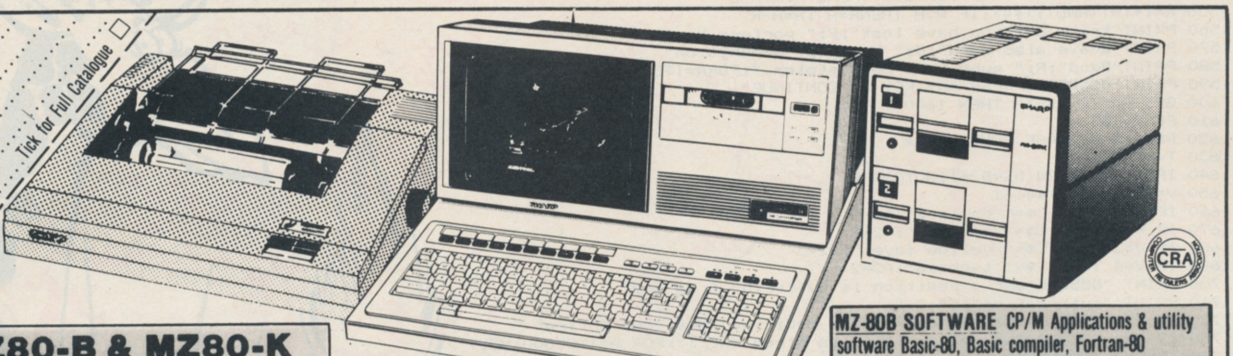

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2540 Y$="  ┌──────╱  "
2550 POKE4466,8:PRINTTAB(B8);X$
2560 POKE4466,9:PRINTTAB(B8);Y$
2570 PRINT"▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁▁"
2580 POKE 4466,19:PRINT"▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔▔"
2590 PRINT "▣"
2600 PRINTTAB(30);"  ╱╲        "
2610 PRINTTAB(30);" ╱╱╲        "
2620 PRINTTAB(30);" ╱╱╱╲____╱"
2630 PRINTTAB(30);"╱ ╱ ╱ ╱╱ "
2640 PRINTTAB(30);" ╱╱ ╱╱ ╱ "
2650 U$=" ✕  ∘∘    ◢  "
2660 V$=" ═══▒▒▒◣◣◣◢◤  "
2670 W$="     ◥   ◥   "
2680 POKE 4466,16:PRINTTAB(B7);U$
2690 POKE 4466,17:PRINTTAB(B7);V$
2700 POKE 4466,18:PRINTTAB(B7);W$
2710 IFB5>.9THENPOKE4466,21:PRINT"▣Unlucky.A crocodile has sunk your boat."
2720 IFB5>.9GOTO 4820
2730 IFB6>.4THENPOKE4466,21:PRINT"▣Your boat was to flimsy.It has sunk.   "
2740 IFB6>.6GOTO 4820
2750 FOR I=B8TO26
2760 POKE4466,8
2770 PRINTTAB(I);X$
2780 PRINTTAB(I);Y$
2790 FORA=1TO90:NEXTA:NEXTI
2800 POKE4466,21:PRINT"You are lucky to escape the crocodiles."
2810 POKE4466,23:PRINTTAB(13);"PRESS ANY KEY"
2820 GETB$:IFB$=""THEN 2820
2830 PRINT "▣"
2840 B8=RND(1)
2850 IF B8>0.35 THEND2=D2+1:GOTO3480
2860 REM ** WITCH DOCTOR ROUTINE **
2870 C3=INT(RND(1)*200):C4=0
2880 C5=INT(RND(1)*3)+1
2890 IF C5=1THEN Q$="Tahata"
2900 IF C5=2THEN Q$="Mganga"
2910 IF C5=3THEN Q$="Ubongo"
2920 PRINTTAB(7);"              "
2930 PRINTTAB(7);"     ╱──╲     "
2940 PRINTTAB(7);"    ┘▪▪└      "
2950 PRINTTAB(7);"    ┐ ▮ ┌     "
2960 PRINTTAB(7);"    ╰╭╮╯      "
2970 PRINTTAB(7);"    ╭╰╯╮      "
2980 PRINTTAB(7);"    ╯▮ ▮╰     "
2990 PRINTTAB(7);"   ╱╱│ │╲╲    "
3000 PRINTTAB(7);"   ╲╲│ │╱╱    "
3010 PRINTTAB(7);"    ╰╯‿╰╯     "
3020 PRINTTAB(7);"   ╱●⁀●╲      "
3030 PRINTTAB(7);"   ╱┌─┐┌─┐╲   "
3040 PRINTTAB(7);"   └│⊗││⊗│┘   "
3050 PRINTTAB(7);"    │ ││ │    "
3060 PRINTTAB(7);"    └┴┘└┴┘    "
3070 PRINT "──────────────────────────────────────"
3080 POKE4466,0
3090 PRINTTAB(20);"▣ ╭╭   ╱╱╱╱╲╲    ╲╲   "
3100 PRINTTAB(20);"▣ ╲╲  ╱╱╱╱ ╲╲   ╱╱   "
3110 PRINTTAB(20);"▣  ╲╲ ╱╱╱╱ ╱╲╲  ╭╭   "
3120 PRINTTAB(20);"▣  │╲╲╱╱╲╱ ╱╲╲╲││   "
3130 PRINTTAB(20);"▣  │╲V╱╲╲ ╲╲╲╲╱╱    "
3140 PRINTTAB(20);"▣  │╰╰ ╲╲ ╲╲╲V╱     "
3150 PRINTTAB(20);"▣  │ │⁓⁓╲╲╱╱V╱│     "
3160 PRINTTAB(20);"▣   │ │⁓╲V╱ ╱╱│     "
3170 PRINTTAB(20);"▣   │ │ │╰ ╰╯ ╰╯│    "
3180 PRINTTAB(20);"▣   │ │ │╰╰╯ │      "
3190 PRINTTAB(20);"▣   │   │ │ │       "
3200 PRINTTAB(20);"▣         │ │       "
3210 PRINTTAB(20);"▣         │ │       "
3220 PRINTTAB(20);"▣         │ │       "
3230 PRINTTAB(20);"▣         │ │       "
3240 PRINTTAB(20);"▣         │ │       "
3250 POKE 4466,10:PRINTTAB(23);CHR$(104)
3260 POKE 4466,9:PRINTTAB(25);CHR$(104)
3270 POKE 4466,10:PRINTTAB(27);CHR$(104)
3280 POKE 4466,9:PRINTTAB(36);CHR$(104)
3290 IFC4=2THENPOKE4466,7:PRINTTAB(21);CHR$(103):POKE4466,17
3300 IFC4=2THENPRINT"▣A new head has been added to the tree.":FORA=1TO99:NEXTA
3310 IFC4=2THENPRINTTAB(17);"▣YOUR'S":FORI=1TO3000:NEXT:PRINT"▣":GOTO4450
3320 POKE 4466,17
3330 PRINT "▣The Great and Magical Witch Doctor"
3340 PRINT ;Q$;" has threatened to lay a curse on"
3350 PRINT "all your company.The porters being very"
3360 PRINT "superstitious will run away if this"
3370 PRINT "happens.";Q$;" demands some beads."
3380 INPUT "How many do you wish to give him ?";B9
3390 IF G-B9<0 THEN PRINT"▣▣You have only";G;" beads left.▣":GOTO 3380
3400 G=G-B9:IF B9>=C3 THEN PRINT "▣▣The Witch Doctor thanks you and wishes"
3410 IF B9>=C3 THEN PRINT "▣you good luck.":PRINT TAB(13);"▣▣PRESS ANY KEY"
3420 IF B9>=C3 THEN GETA$:IF A$=""THEN 3420
3430 IF B9>=C3 THEN 3480
3440 PRINT "▣▣Only";B9;" boxes of beads.The Witch"
3450 PRINT "▣Doctor lays a curse and all your men"
3460 PRINT "▣have run away."
3470 FORA=1TO3000:NEXTA:C4=2:PRINT"▣":GOTO2900
3480 IF D2<5 THEN 3590
3490 REM ** PERFECT WEEK **
3500 D4=INT(RND(1)*200)+10
3510 E=E+D4
3520 PRINT "▣▣▣Well done.You have made a good.▣"
3530 PRINT "uninterrupted week's march.Also friendly"
3540 PRINT "natives have boosted your food supply▣"
3550 PRINT "by giving you";D4;" packs."
3560 PRINT TAB(13);"▣▣PRESS ANY KEY"
3570 GET A$:IF A$=""THEN 3570
3580 D2=0:GOTO 3590
3590 G1=INT(D*100):C=C-G1
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3600 G2=INT(D*2):E=E-G2
3610 IF C<0 THEN PRINT "■You haven't enough annas to pay the■"
3620 IF C<0 THEN PRINT "porters.They have left you without any■"
3630 IFC<0THENPRINT"food to die in the jungle.":FORI=1TO4000:NEXT:PRINT"▣"
3640 IF C<0 THEN 4450
3650 IFE<0THENPRINT"■You haven't enough food packs to give"
3660 IFE<0THENPRINT"■the porters to eat.They have murdered"
3670 IFE<0THENPRINT"■you for leaving them in the jungle to"
3680 IFE<0THENPRINT"■die.":FOR I=1TO4000:NEXT:PRINT"▣":GOTO4450
3690 PRINT "▣This week you paid your porters";G1
3700 PRINT "■annas and they ate";G2;" food packs."
3710 PRINT TAB(13);"■■PRESS ANY KEY"
3720 GET B$:IF B$=""THEN 3720
3730 D2=0:Z=Z+1:GOTO 3740
3740 PRINT "▣"
3750 REM ** EXPEDITION CONDITION **
3760 IF Z=0 THEN PRINT "■At the beginning of your expedition you■ have:-"
3770 IF Z>0 THEN PRINT "■The state of your expedition after";Z
3780 IF Z>0 THEN PRINT "■weeks is:-"
3790 POKE 4466,3
3800 FOR I=1 TO 7
3810 PRINT"┌──────────────────────────────┐"
3820 PRINT"│                              │"
3830 PRINT"└──────────────────────────────┘"
3840 NEXT
3850 POKE 4466,4:PRINT "◙";D;" PORTERS"
3860 POKE 4466,7:PRINT "◙";E;" FOOD PACKS"
3870 POKE 4466,10:PRINT"◙";F;" BOXES OF MEDICINE"
3880 POKE 4466,13:PRINT"◙";G;" BOXES OF BEADS"
3890 POKE 4466,16:PRINT"◙";H;" GUNS(RIFLES)"
3900 POKE 4466,19:PRINT"◙";K;" BOXES OF AMMUNITION"
3910 POKE 4466,22:PRINT"◙";C;" ANNAS REMAINING"
3920 POKE 4466,22:PRINT TAB(26);"PRESS ANY KEY"
3930 GETB$:IFB$=""THEN 3930
3940 REM ** DETAILED MAP OF AFRICA **
3950 PRINT "▣"
3960 FOR J=1 TO 150
3970 SET V(J),W(J)
3980 NEXT
3990 DATA 63,0,62,1,61,1,61,2,59,3,60,3,14,3,13,4,15,4,59,4,58,5
4000 DATA 12,5,14,5,11,6,13,6,57,6,12,7,13,7,57,7,23,8,55,8,56,8
4010 DATA 20,9,21,9,22,9,24,9,25,9,55,9,24,8,18,10,19
4020 DATA 10,25,10,26,10,54,10,19,11,25,11,27,11,53,11,18,12,17,12,25,12
4030 DATA 52,12,16,13,26,13,52,13,17,14,25,14,50,14,51,14
4040 DATA 18,15,24,15,25,15,49,15,17,16,23,16,24,16,49,16,18,17
4050 DATA 23,17,48,17,17,18,19,18,20,18,24,18,47,18,19,19,9,22
4060 DATA 21,19,23,19,48,19,22,20,46,20,47,20,46,21,46,22,8,23,10,23,45,23
4070 DATA 7,24,10,24,45,24,8,25,10,25,44,25,8,26,11,26,44,26,9,27
4080 DATA 11,27,44,27,9,28,11,28,44,28,10,29,12,29,43,29,10,30
4090 DATA 13,30,43,30,10,31,12,31,43,31,44,31,9,32,12,32,
4100 DATA 45,32,10,33,12,33,46,33,10,34,13,34,14,34,46,34,11,35,15,35
4110 DATA 45,35,12,36,13,36,16,36,15,46,45,36,14,37,16,37,44,37,13,38,16,38
4120 DATA 13,43,16,43,14,44,16,44,14,45,16,45,13,42
4130 DATA 45,38,14,39,16,39,45,39,14,40,17,40,46,40,14,41,18,41,47,41,17,42
4140 DATA 47,42,47,43,47,44,48,44,49,45,49,46,50,47,49,48,49,49
4150 POKE 4466,14:PRINT TAB(7);"x"
4160 POKE 4466,15:PRINT TAB(23);"*"
4170 POKE 4466,10:PRINT TAB(26);"Indian Ocean"
4180 POKE4466,5
4190 PRINT TAB(31);"▒"
4200 PRINT TAB(31);" ⌜⟍"
4210 PRINT TAB(29);"¬▒│⟍⌣ "
4220 PRINT TAB(26);"__▀▀▀▀__"
4230 POKE 4466,4:PRINT TAB(13);"L.Victoria"
4240 POKE 4466,16:PRINT TAB(7);"L.Tanganyika"
4250 POKE4466,17:PRINTTAB(25);CHR$(99);"-Your Position"
4260 FORI=1TO300:NEXT
4270 IF Z=0THENPOKEA7,202:MUSIC"DO¯"
4280 IFZ=1THENFORI=(A7-3)TOA8STEP-1:POKE I,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4290 IFZ=1 THEN POKEI,0:NEXTI:POKEA8,202
4300 IFZ=2THENFORI=A8TOA9STEP-1:POKE I,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4310 IF Z=2 THEN POKE I,0:NEXTI:POKEA9,202
4320 IFZ=3THENFORI=A9TOB0STEP-1:POKEI,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4330 IF Z=3 THEN POKE I,0:NEXTI:POKEB0,202
4340 IFZ=4THENFORI=B0TOB1STEP-1:POKEI,202:MUSIC"DO¯":FORA=1TO120:NEXTA
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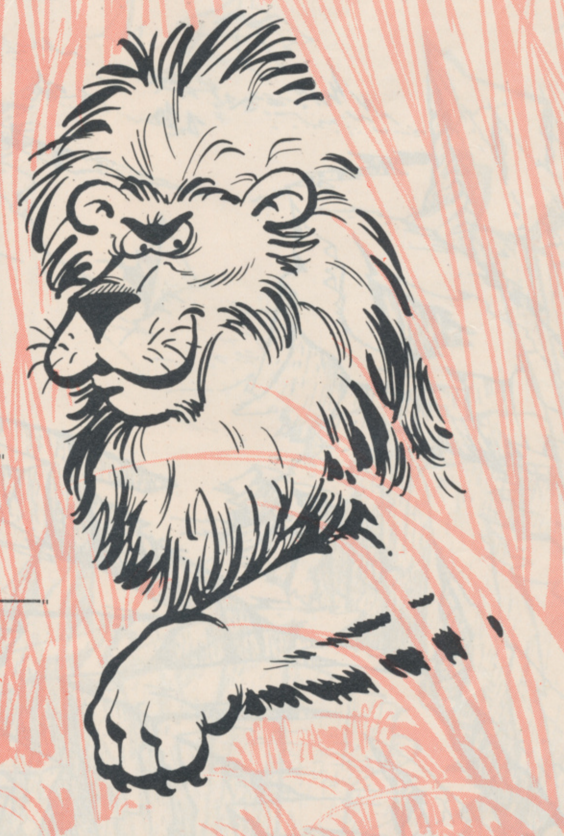
4350 IF Z=4THEN POKEI,0:NEXTI:POKE B1,202
4360 IFZ=5THENFORI=B1TOB2STEP-40:POKEI,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4370 IF Z=5THENPOKEI,0:NEXTI:POKEB2-1,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4380 IF Z=5THENPOKEB2-1,0:MUSIC"DO¯":POKEB2-2,202
4390 IFZ=6THENFORI=(B2-2)TOB3STEP-1:POKEI,202:MUSIC"DO¯":FORA=1TO120:NEXTA
4400 IF Z=6THENPOKEI,0:NEXTI:POKEB3,202
4410 POKE 4466,22:PRINT TAB(26);"PRESS ANY KEY"
4420 GET B$:IF B$=""THEN 4420
4430 IFZ=6 THEN 4980
4440 RESTORE:GOTO1250
4450 PRINT"▩▩▩▩▒   ▒ ▒▒▒▒▒ ▒   ▒ ▒ ▒▒▒▒▒  ▒▒▒▒▒"
4460 PRINT"▩▩▩▩▒   ▒ ▒   ▒ ▒   ▒╯▒   ▒ ▒     "
4470 PRINT"▩▩▩▩◥ ◢ ▒   ▒ ▒   ▒ ▒   ▒ ▒     "
4480 PRINT"▩▩▩▩ ▒  ▒   ▒ ▒   ▒ ▒▒▒▒◤ ▒▒▒▒ "
4490 PRINT"▩▩▩▩ ▒  ▒   ▒ ▒   ▒ ▒  ◥  ▒     "
4500 PRINT"▩▩▩▩ ▒  ▒▒▒▒▒ ▒▒▒▒▒ ▒   ◥ ▒▒▒▒▒"
4510 PRINT
4520 PRINT"▩▩▩▩▩▩▩▩        ◢▒▒◣ "
4530 PRINT"▩▩▩▩▩▩▩▩        ▒  ▒ "
4540 PRINT"▩▩▩▩▩▩▩▩        ▒  ▒ "
4550 PRINT"▩▩▩▩▩▩▩▩        ▒▔▔▒ "
4560 PRINT"▩▩▩▩▩▩▩▩        ▒  ▒ "
4570 PRINT"▩▩▩▩▩▩▩▩        ▒  ▒ "
4580 PRINT
4590 PRINT"▒▒▒▒▒ ◢▒▒◣ ▒▒▒ ▒   ▒ ▒ ▒▒▒▒▒ ◢▒▒▒▒"
4600 PRINT"▩▒    ▒  ▒ ▒ ▒   ▒ ▒ ▒ ▒ ▒     "
4610 PRINT"▩▒    ▒  ▒ ▒ ▒   ▒ ▒ ▒ ▒ ▒"
4620 PRINT"▒▒▒▒ ▒▔▔▒ ▒ ▒  ▒ ▒▒▒▒◤ ▒▒▒▒"
4630 PRINT"▒    ▒  ▒ ▒ ▒  ▒ ▒ ▒ ◥ ▒"
4640 PRINT"▒    ▒  ▒ ▒▒▒ ▒▒▒ ▒▒▒▒ ▒  ◥ ▒▒▒▒▒"
4650 FOR A=1 TO 5000:NEXT
4660 PRINT "▩"
4670 POKE 4466,10
4680 PRINT "▩▩▩DO YOU WANT ANOTHER GAME(Y/N)."
4690 GET B$:IF B$=""THEN 469C
4700 IF B$="Y" THEN RESTORE:GOTO20
4710 IFB$="N"THENPRINT"▩":POKE4466,12:PRINTTAB(16);"Thank-you":GOTO 4710
4720 GOTO 4690
4730 PRINT"▩":IF S=1 THEN A$=" guns "
4740 IF S=2 THEN A$=" ammunition "
4750 PRINT"▩▩▩▩▩▩▩▩You have no";A$;"left.The natives "
4760 PRINT"▩have killed you and your men."
4770 FORA=1TO3000:NEXT:PRINT"▩":GOTO4450
4780 PRINT TAB(5);"FUNDS REMAINING:";C;" ANNAS"
4790 C$=STR$(C):PRINT:FORA=1TOLEN(C$)
4800 PRINT TAB(21+A);"▩¯":NEXT
4810 RETURN
4820 POKE 4466,8:PRINT"                    "
4830 POKE 4466,9:PRINT"                    "
4840 CO=11
4850 POKE 4466,CO
4860 PRINTTAB(B8);I$
4870 PRINTTAB(B8);X$
4880 PRINTTAB(B8);Y$
4890 IF CO=16 THEN 4910
4900 CO=CO+1:FORI=1TO200:NEXT:GOTO4850
4910 C1=22
4920 POKE4466,16
4930 PRINTTAB(C1);U$
4940 PRINTTAB(C1);V$
4950 PRINTTAB(C1);W$
4960 IFC1=0THENFORI=1TO4000:NEXT:PRINT"▩":GOTO4450
4970 C1=C1-1:MUSIC"EO¯":FORI=1TO90:NEXT:GOTO4920
4980 PRINT "▩":GOSUB 5250
4990 FOR T1=1TO18:S=T1:POKE 4466,2
5000 PRINTTAB(S);"  @@@   ":PRINTTAB(26);"▩  _▒▒@ "
5010 PRINTTAB(S);" @ ∘∘@  ":PRINTTAB(26);"▩  @∘∘@@"
5020 PRINTTAB(S);"  ╰─╯/  ":PRINTTAB(26);"▩  \╰─╯ "
5030 PRINTTAB(S);"   ╲╱   ":PRINTTAB(26);"▩   ╲╱  "
5040 PRINTTAB(S);"  ╭──╮  ":PRINTTAB(26);"▩  ╭──╮ "
5050 PRINTTAB(S);"  \\ |  ":PRINTTAB(26);"▩  | /| "
5060 PRINTTAB(S);"  |\\ |  ":PRINTTAB(26);"▩  | //| "
5070 PRINTTAB(S);"  |\__==>":PRINTTAB(26);"▩<==__/| "
5080 PRINTTAB(S);"  |   |  ":PRINTTAB(26);"▩  |   | "
5090 PRINTTAB(S);"  \___/ ":PRINTTAB(26);"▩  \___/ "
5100 PRINTTAB(S);"   |||  ":PRINTTAB(26);"▩   |||  "
5110 PRINTTAB(S);"   |||  ":PRINTTAB(26);"▩   |||  "
5120 PRINTTAB(S);"   |||  ":PRINTTAB(26);"▩   |||  "
5130 PRINTTAB(S);"   |||  ":PRINTTAB(26);"▩   |||  "
5140 PRINTTAB(S);"   ~~~ ":PRINTTAB(26);"▩  ~~~   "
5150 NEXT T1
5160 GOSUB 5270
5170 POKE 4466,19:PRINT TAB(6);"Dr.Livingstone I presume ?"
5180 FORI=1TO3500:NEXT
5190 PRINT"▩":POKE 4466,8
5200 PRINT"Congratulations,you have completed your"
5210 PRINT"▩objective.You are now are Sir Henry"'
5220 PRINTTAB(26);"▔▔▔"
5230 PRINT"Morton Stanley.":FORI=1TO3500:NEXT
5240 GOTO 4660
5250 POKE4466,17:PRINT"────────────────────────────────────────"
5260 RETURN
5270 POKE4466,6
5280 PRINT "          _^_       "
5290 PRINT "         /   \      "
5300 PRINT "       _/▌   ▐\_    "
5310 PRINT "     /‾‾‾‾‾‾‾‾‾‾\   "
5320 PRINT "     |WELCOME   |   "
5330 PRINT "     |          |   "
5340 PRINT "     |TO UJIJI  |   "
5350 PRINT "     |          |   "
5360 PRINT "     | ┌─┐ ┌───┐|   "
5370 PRINT "     | └─┘ |   ||   "
5380 PRINT "     |     |   ||   "
5390 RETURN
```



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Ten drone ships have to be landed in secret on the planet's surface, but because of the Terran threat the landing site is constantly moving.

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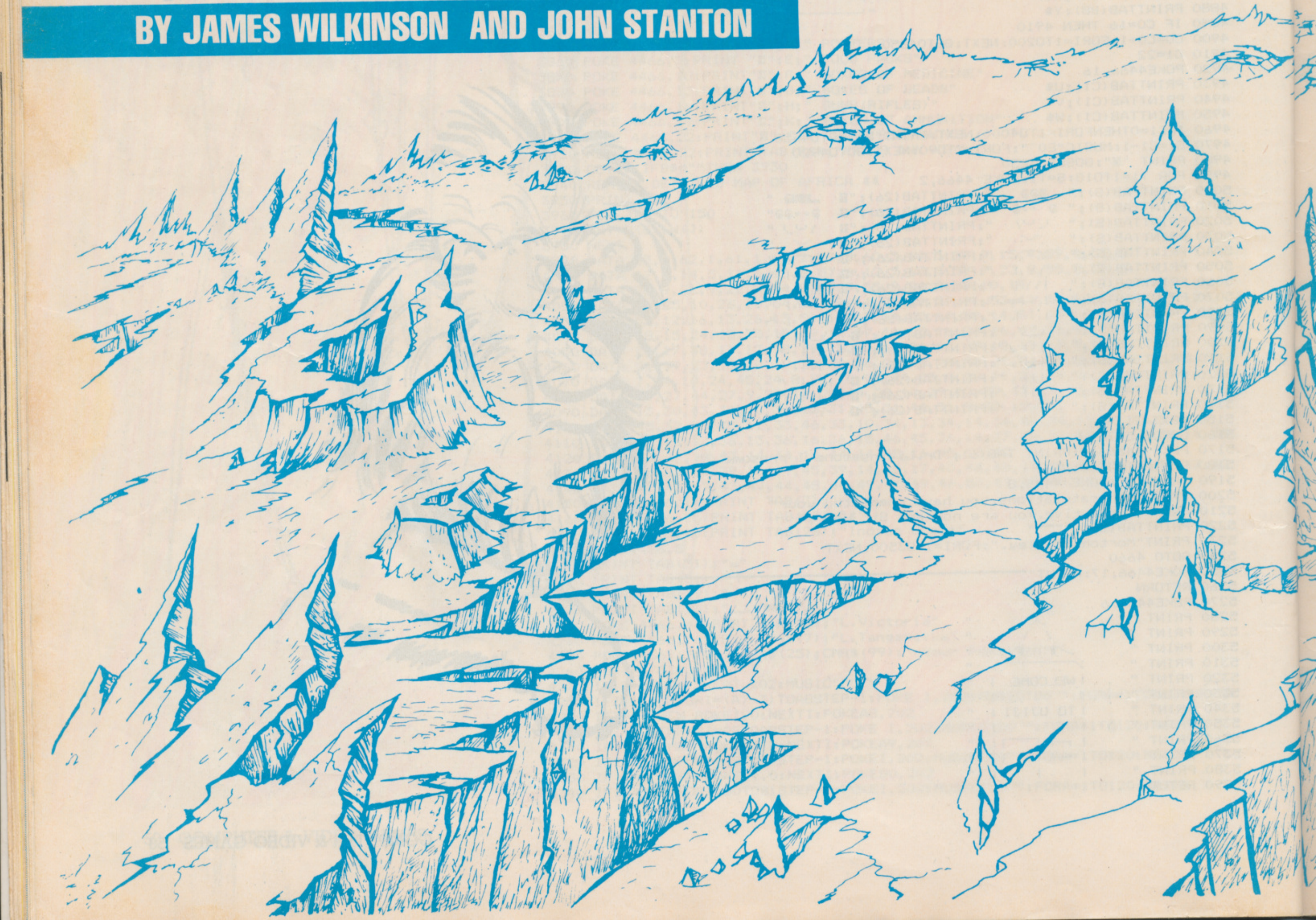
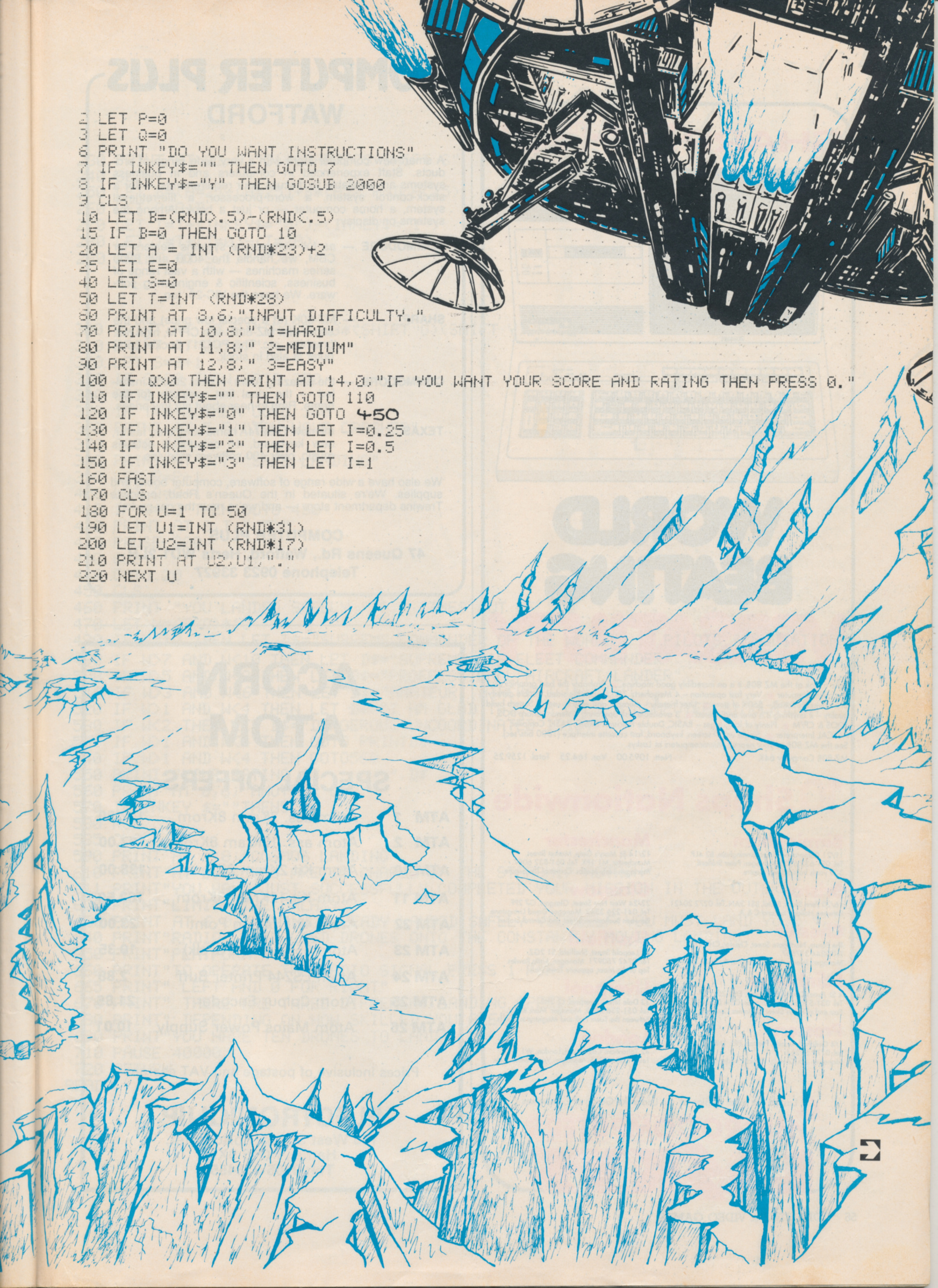
Be prepared for some criticism if your drones crash on the planet's surface instead of the base.

RUNS ON A SINCLAIR ZX81 WITH 16K RAM PACK

BY JAMES WILKINSON AND JOHN STANTON



```
2 LET P=0
3 LET Q=0
6 PRINT "DO YOU WANT INSTRUCTIONS"
7 IF INKEY$="" THEN GOTO 7
8 IF INKEY$="Y" THEN GOSUB 2000
9 CLS
10 LET B=(RND>.5)-(RND<.5)
15 IF B=0 THEN GOTO 10
20 LET A = INT (RND*23)+2
25 LET E=0
40 LET S=0
50 LET T=INT (RND*28)
60 PRINT AT 8,6;"INPUT DIFFICULTY."
70 PRINT AT 10,8;" 1=HARD"
80 PRINT AT 11,8;" 2=MEDIUM"
90 PRINT AT 12,8;" 3=EASY"
100 IF Q>0 THEN PRINT AT 14,0;"IF YOU WANT YOUR SCORE AND RATING THEN PRESS 0."
110 IF INKEY$="" THEN GOTO 110
120 IF INKEY$="0" THEN GOTO 450
130 IF INKEY$="1" THEN LET I=0.25
140 IF INKEY$="2" THEN LET I=0.5
150 IF INKEY$="3" THEN LET I=1
160 FAST
170 CLS
180 FOR U=1 TO 50
190 LET U1=INT (RND*31)
200 LET U2=INT (RND*17)
210 PRINT AT U2,U1;"."
220 NEXT U
```



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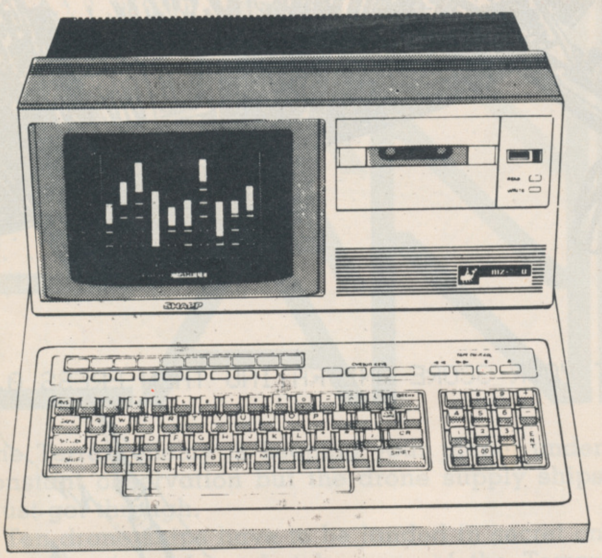
SHARP MZ-80B



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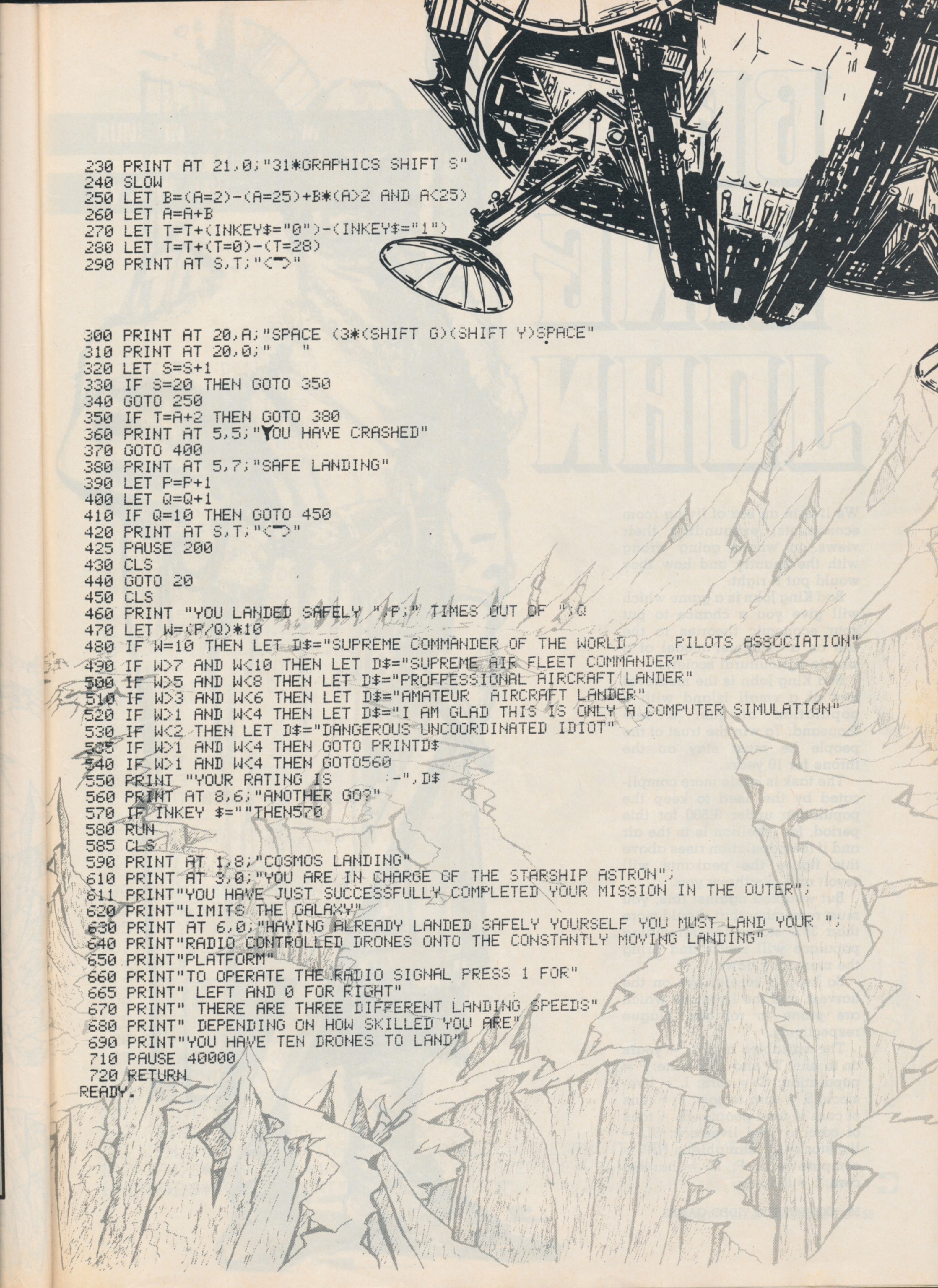

```
 230 PRINT AT 21,0;"31*GRAPHICS SHIFT S"
 240 SLOW
 250 LET B=(A=2)-(A=25)+B*(A>2 AND A<25)
 260 LET A=A+B
 270 LET T=T+(INKEY$="0")-(INKEY$="1")
 280 LET T=T+(T=0)-(T=28)
 290 PRINT AT S,T;"<▀>"


 300 PRINT AT 20,A;"SPACE (3*(SHIFT G)(SHIFT Y)SPACE"
 310 PRINT AT 20,0;"   "
 320 LET S=S+1
 330 IF S=20 THEN GOTO 350
 340 GOTO 250
 350 IF T=A+2 THEN GOTO 380
 360 PRINT AT 5,5;"YOU HAVE CRASHED"
 370 GOTO 400
 380 PRINT AT 5,7;"SAFE LANDING"
 390 LET P=P+1
 400 LET Q=Q+1
 410 IF Q=10 THEN GOTO 450
 420 PRINT AT S,T;"<▀>"
 425 PAUSE 200
 430 CLS
 440 GOTO 20
 450 CLS
 460 PRINT "YOU LANDED SAFELY ";P;" TIMES OUT OF ";Q
 470 LET W=(P/Q)*10
 480 IF W=10 THEN LET D$="SUPREME COMMANDER OF THE WORLD      PILOTS ASSOCIATION"
 490 IF W>7 AND W<10 THEN LET D$="SUPREME AIR FLEET COMMANDER"
 500 IF W>5 AND W<8 THEN LET D$="PROFFESSIONAL AIRCRAFT LANDER"
 510 IF W>3 AND W<6 THEN LET D$="AMATEUR  AIRCRAFT LANDER"
 520 IF W>1 AND W<4 THEN LET D$="I AM GLAD THIS IS ONLY A COMPUTER SIMULATION"
 530 IF W<2 THEN LET D$="DANGEROUS UNCOORDINATED IDIOT"
 535 IF W>1 AND W<4 THEN GOTO PRINTD$
 540 IF W>1 AND W<4 THEN GOTO560
 550 PRINT "YOUR RATING IS     :-",D$
 560 PRINT AT 8,6;"ANOTHER GO?"
 570 IF INKEY $=""THEN570
 580 RUN
 585 CLS
 590 PRINT AT 1,8;"COSMOS LANDING"
 610 PRINT AT 3,0;"YOU ARE IN CHARGE OF THE STARSHIP ASTRON";
 611 PRINT"YOU HAVE JUST SUCCESSFULLY COMPLETED YOUR MISSION IN THE OUTER";
 620 PRINT"LIMITS THE GALAXY"
 630 PRINT AT 6,0;"HAVING ALREADY LANDED SAFELY YOURSELF YOU MUST LAND YOUR ";
 640 PRINT"RADIO CONTROLLED DRONES ONTO THE CONSTANTLY MOVING LANDING"
 650 PRINT"PLATFORM"
 660 PRINT"TO OPERATE THE RADIO SIGNAL PRESS 1 FOR"
 665 PRINT" LEFT AND 0 FOR RIGHT"
 670 PRINT" THERE ARE THREE DIFFERENT LANDING SPEEDS"
 680 PRINT" DEPENDING ON HOW SKILLED YOU ARE"
 690 PRINT"YOU HAVE TEN DRONES TO LAND"
 710 PAUSE 40000
 720 RETURN
READY.
```

BAD KING JOHN

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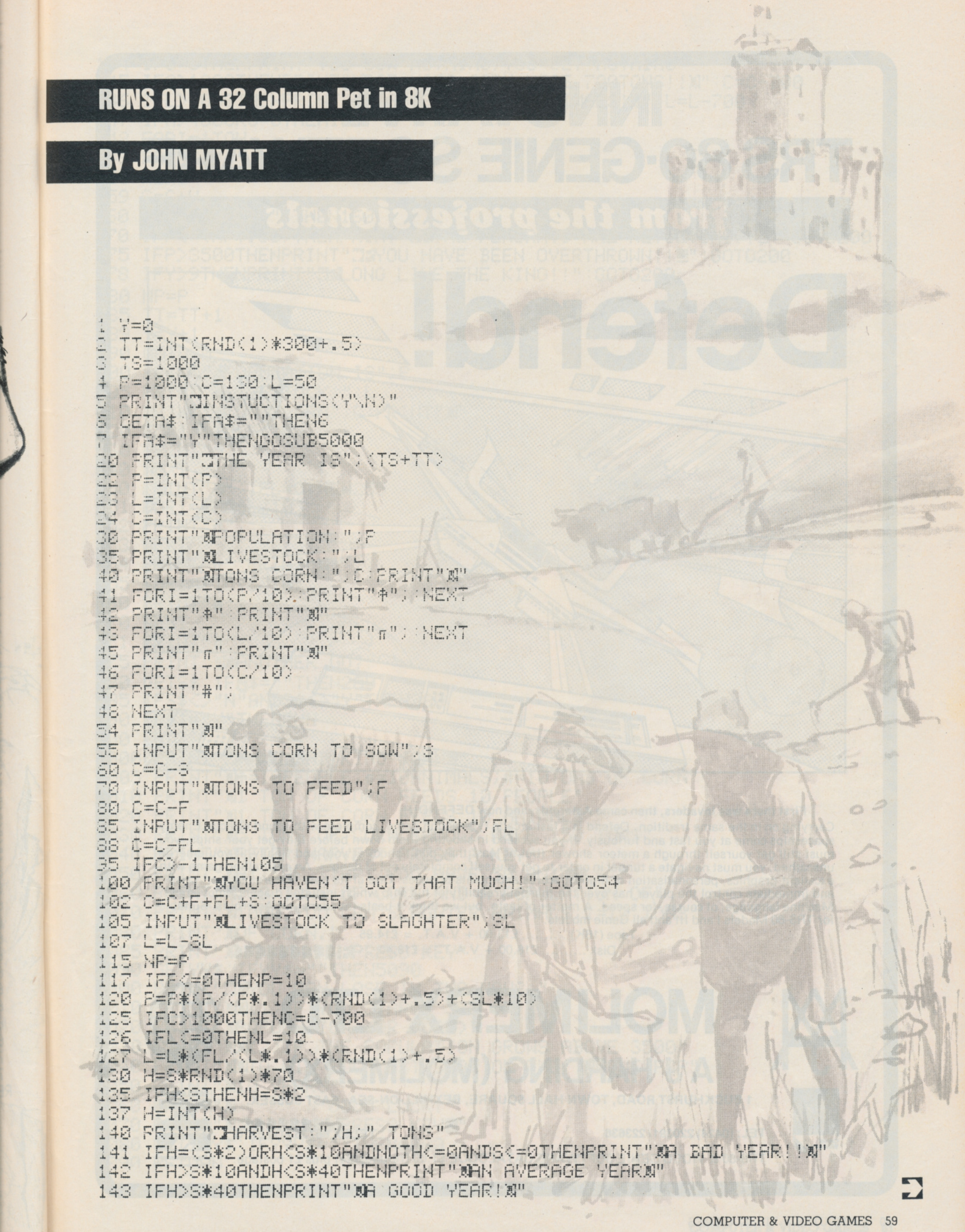
But weighed against this, you must remember that should more than 30% starve the remaining populace will revolt and bring the monarchy down.

So keep a careful eye on the harvest and the livestock which are prone to rot and plague respectively.

The variables are: Y = years on throne; TT and TS = date; P = population; C = corn; L = livestock; S = corn to sow; F = tons of corn to feed people; FL = tons of corn to feed livestock; SL = livestock to slaughter; NP = compare with P; H = harvest corn; I = looping.

RUNS ON A 32 Column Pet in 8K

By JOHN MYATT



```
1 Y=0
2 TT=INT(RND(1)*300+.5)
3 TS=1000
4 P=1000:C=130:L=50
5 PRINT"▣INSTUCTIONS(Y\N)"
6 GETA$:IFA$=""THEN6
7 IFA$="Y"THENGOSUB5000
20 PRINT"▣THE YEAR IS";(TS+TT)
22 P=INT(P)
23 L=INT(L)
24 C=INT(C)
30 PRINT"☒POPULATION:";P
35 PRINT"☒LIVESTOCK:";L
40 PRINT"☒TONS CORN:";C:PRINT"☒"
41 FORI=1TO(P/10):PRINT"♠";:NEXT
42 PRINT"♠":PRINT"☒"
43 FORI=1TO(L/10):PRINT"π";:NEXT
45 PRINT"π":PRINT"☒"
46 FORI=1TO(C/10)
47 PRINT"#";
48 NEXT
54 PRINT"☒"
55 INPUT"☒TONS CORN TO SOW";S
60 C=C-S
70 INPUT"☒TONS TO FEED";F
80 C=C-F
85 INPUT"☒TONS TO FEED LIVESTOCK";FL
88 C=C-FL
95 IFC>-1THEN105
100 PRINT"☒YOU HAVEN'T GOT THAT MUCH!":GOTO54
102 C=C+F+FL+S:GOTO55
105 INPUT"☒LIVESTOCK TO SLAGHTER";SL
107 L=L-SL
115 NP=P
117 IFF<=0THENP=10
120 P=P*(F/(P*.1))*(RND(1)+.5)+(SL*10)
125 IFC>1000THENC=C-700
126 IFL<=0THENL=10
127 L=L*(FL/(L*.1))*(RND(1)+.5)
130 H=S*RND(1)*70
135 IFH<STHENH=S*2
137 H=INT(H)
140 PRINT"▣HARVEST:";H;" TONS"
141 IFH=(S*2)ORH<S*10ANDNOTH<=0ANDS<=0THENPRINT"☒A BAD YEAR!!☒"
142 IFH>S*10ANDH<S*40THENPRINT"☒AN AVERAGE YEAR☒"
143 IFH>S*40THENPRINT"☒A GOOD YEAR!☒"
```

➜

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```
144 IFS=0THENPRINT"YOU SOW NOTHING;YOU GET NOTHING"
145 IFC>1000THENPRINT"⊠ROT HITS CORN;LOSE 700TONS!!⊠":C=C-700
146 IFL>1000THENPRINT"⊠PLAGUE!LOSE700 ANIMALS!⊠":L=L-700
147 IFH>4000ORS=0THEN159
148 FORI=1TOH
149 PRINT"#|";
155 NEXT
159 C=C+H
160 GETY$:IFY$=""THEN160
170 IFP<=(NP*.65)THENPRINT"❐▣THE PEASANTS ARE REVOLTING!!■":GOTO200
175 IFP>3500THENPRINT"❐▣YOU HAVE BEEN OVERTHROWN!!■":GOTO200
178 IFY>9THENPRINT"❐▣LONG LIVE THE KING!!":GOTO200
180 NP=P
185 TT=TT+1
189 Y=Y+1
190 GOTO20
200 PRINT"⊠POPULATION IS";P
205 PRINT"⊠LIVESTOCK:";L
210 PRINT"⊠TONS CORN";C:PRINT"⊠"
220 FORI=1TO(P/10)
230 PRINT"♠";
240 NEXT
250 PRINT"⊠":IFL=0THEN255
251 FORI=1TO(L/10)
252 PRINT"π";
253 NEXT
254 PRINT"π":PRINT"⊠"
255 FORI=1TO(C/10)
260 PRINT"#";
270 NEXT
271 PRINT"#"
275 PRINT"⊠⊠ANOTHER GO?"
280 GETS$:IFS$=""THEN280
285 IFS$<>"N"ANDS$<>"Y"THEN280
290 IFS$="Y"THENRUN
300 END
5000 PRINT"❐▶▶▶▶▣BAD KING JOHN■"
5005 PRINT"⊠♠=10PEOPLE;π=10ANIMALS;#=10TONS OF CORN"
5010 PRINT"⊠1 TON OF CORN FEEDS 10 PEOPLE"
5020 PRINT"⊠1 TON OF CORN FEEDS 10 ANIMALS"
5030 PRINT"⊠5 TONS OF CORN SHOULD MAKE 150 TONS"
5040 PRINT"⊠AFTER HARVEST PRESS A KEY"
5050 PRINT"⊠AT THE START YOU HAVE 50 ANIMALS,"
5060 PRINT"⊠130 TONS OF CORN AND A POPULATION OF"
5070 PRINT"⊠1000.YOU CAN SLAGHTER ANIMALS;1=10 TONS"
5080 PRINT"⊠OF CORN."
5085 PRINT"⊠▶▶▶▶▶▶▶▶▶▶▣PRESS KEY"
5090 GETYY$:IFYY$=""THEN5090
6000 PRINT"❐⊠YOU CAN LOSE IN TWO WAYS:"
6010 PRINT"⊠⊠(1)IF YOU STARVE 30% OF THE"
6020 PRINT"⊠POPULATION (OR MORE)"
6030 PRINT"⊠⊠(2)IF THE POPULATION GROWS ABOVE 3500"
6040 PRINT"⊠⊠TO WIN YOU MUST STAY ON THE THRONE FOR"
6050 PRINT"⊠10 YEARS"
6060 PRINT"⊠          GOOD LUCK!"
6070 PRINT"⊠▣▶▶▶▶▶▶▶▶▶PRESS KEY■"
6080 GETYYY$:IFYYY$=""THEN6080
6090 RETURN
```

Adventure

So far we have seen how to create a network, fill it with objects, and decode the player's response. Movement was by typing "N" for "GO NORTH" etc. Now we will progress so that we can use a two word response.

The first problem is that the main, if not only 'moving' verb is "GO", length 2. Our standard sub-string length is to be 3. This can be padded out, so:

IF LEN (R2$) = 2 THEN LET R2$ = R2$ + " "

and must be done before R4$ is set or an error will result.

How can verbs be categorised? "GO" will change a location, "TAKE" or "DROP" will change the inventory and location number of an object, whilst other verbs may have varying and less standard effects. Therefore, for the purposes of Adventure programming, verbs can be placed into one of three categories: Moving verbs; Possession verbs; Others.

Of these (moving verbs) is fundamentally different in that the word following, will be a direction and not necessarily a noun. To speed up the string searches it will pay to have a separate direction string from the noun string and only search the directions if a moving verb is detected. So:

LET W3$ = "NORSOUEASWESCOT"

Referring to the simple network in Figure 2, we previously entered the cottage from the forest by typing "N" which was found in exit string E$(2) = "NE", i.e. using a compass bearing. It would provide variety and add elegance to be able to reply "GO COTTAGE" (even if not fantastic English). The player would have to be supplied information or a clue to the existance of such a cottage, either in the location descriptions L$(1) and L$(2) or by a "help" clue.

"COTTAGE" must now be assigned a direction code: north = N south = S cottage = X

I have used X for the cottage rather than C to demonstrate flexibility, since more than one exit with the same first letter may occur. Exit strings read:
LET E$)1) = "XS" : LET E$(2) = "XE"

Variable Name	Description	Value in the Example (where relevant)
R1$	Input string	GO COTTAGE
R2$	1st word input	GO
R3$	2nd word input	COTTAGE
R4$	1st 3 letters of E2$	COT-
R5$	ditto R3$	GOT
I	counter	
LN	current location no.	1
K1	No. of current valid R2$	1
K2	No. of current valid R3$	5
J	No. of found word in search	13
C$	temp variable for string to be searched	
CC$	temp variable for element being sought	
W1$	Verb string	GO TAKDRO
W2$	Noun string	
W3$	Direction string	NORSOUEASWESCOT
W4$	Direction code string	NSEWX
OS$	Seen objects for screen display	
O$(n)	Object description	
P(n)	Object location	
L$(m)	Location description	
	Exits from location	
D$(m)	Destinations	

Search subroutine returns J = 13 for COTTAGE
K2 = (((J — 1) /3) + 1) = 5 and code = MID$ (W4$,K2,1)

FIGURE 1. List of variable names used so far and their uses in example described.

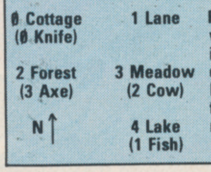


Fig. 2: Simplified network of locations showing initial positions of objects in brackets. Note: objects and locations independently numbered.

Next establish a direction code string that aligns arithmetically with the direction string W3$:
LET W4$ = "NSEWX"

With these strings together with the string search subroutine previously explained, it all fits together as shown below.

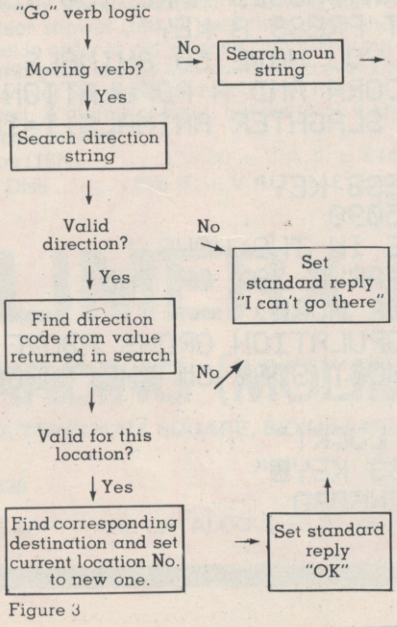

"Go" verb logic
Moving verb?
No
Search noun string
Yes
Search direction string
Valid direction?
No
Set standard reply "I can't go there"
Yes
Find direction code from value returned in search
No
Valid for this location?
Yes
Find corresponding destination and set current location No. to new one.
Set standard reply "OK"

Figure 3

WHAT'S IN A PYRAMID

What's in a pyramid? Quite a lot if you compare Scott Adams' Pyramid of Doom with the Tandy version of Adventure Pyramid.

The former follows the usual Scott Adams split screen format while the latter has a continuously scrolling display with a rather verbose narrative style. When the player moves to a new location a response like ". . . your are standing at the west end of a large chamber. A rough stone staircase leads up behind you . . ." is apt to leave him rather confused, especially if he has just re-entered the chamber from the opposite direction. Has he turned around, or, is there a staircase behind him and in front? It was all too much for me after a while, but it seems you either like it or you don't. My wife sat up for hours making maps and notes — she even took the bird-statue and statue-box in her stride! Some heavy typing is required in this game, as — unlike most Adventures — nearly all instructions must be entered in full. ("Inventory" seems such a long word after a while!)

Pyramid of Doom has some difficult parts, but on the whole is easy enough to give the novice sufficient encouragement to persevere — once he has got inside! The player isn't left with quite the same feeling of lofty galleries and vast chambers that "Pyramid" conveys, because the display is more "compartmentalised". Nevertheless the layout of the interior is both credible and interesting. Nervous tension is created by the unexpected appearance of a small nomad, who proceeds to follow the player around. Is he as sinister as he seems?

There is humour to be found in the Throne Room — but don't hang around too long! And don't be fooled by an apparently incorrect score — eliminate the culprit. (Scott Adams can count even if he can't spell!)

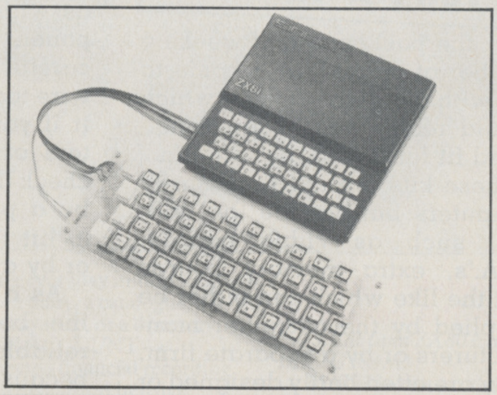
Pyramid is published by Tandy Machines and runs on the TRS-80 and Video Genie

Pyramid of Doom by Scott Adams is published by Adventure International and runs on the TRS-80, Models I & II, Video Genie, Apple and Pet.

BY KEITH CAMPBELL

ZX 80/81 HARDWARE/SOFTWARE

ZX KEYBOARD



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DEFLEX This totally new and very addictive game, which was highly acclaimed at the Microfair, uses fast moving graphics to provide a challenge requiring not only quick reaction, but also clever thinking. One and two player versions on same cassette. £3.95
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CENTIPEDE. This is the first implementation of the popular arcade game on any micro anywhere. Never mind your invaders, etc., this is positively shining, the speed at which this runs makes ZX invaders look like a game of simple snap. £4.95.
Please add £1 p&p for all hardware, Software p&p free. Specify ZX80/81 on order.
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Kit Korner

FIT FOR FILE 13

Over the past couple of weeks a number of people have come to me with home-built kits which should really have been considered fit for file 13, i.e. the bin.

These kits are not necessarily computers but can be the add-ons, such as video boards, P.I.A.'s, extra memory boards and the like which can either be supplied by the computer manufacturers or by a separate firm. They are often badly designed or are so complex that a good deal of hard wiring is required. It is this exercise that can be the downfall of many-a-good computer constructor.

The boards that I have seen have been coated with a solder mask to prevent shorts on the circuit. This, unfortunately, can be counter-productive as it is difficult to see whether or not there are any open-circuit tracks around the pads. On the other hand it does help considerably the heavy-handed constructor who is liable to splash solder about the place.

When making hard-wired links on the board I prefer to use single core, P.V.C. insulated conductor as this can be easily straightened and can be bent at right-angles, unlike the multi-stranded types. I use 1/0.7mm gauge. I also make use of as many colours as possible and take note of where I have used them. This helps tremendously in tracing out the circuit later on.

By measuring the hole spacing, bending up the wire and then stripping you can ensure, as with resistors, that the component fits neatly in. Be very careful that you do not crimp the wire too much or accidentally cut it if you are stripping with cutters or a knife. Again, double check that the link is good, either by a physical test — by trying to lift the wire off the board — or by a continuity test.

As a general rule, the neater the board appears, the more reliable it is. This may be only because it requires more care and attention to produce one. Wires which meander about the board are unsightly and are prone to physical stresses and strains, whereas a connection made tight on the top of the board looks good and is difficult to interfere with.

It must be remembered that any links that must be made, unless otherwise specified, must be made after completed construction. As well as using all of the available colours, I try to put in the shortest links first, gradually building up to the longest, which on some boards may be from one end to the other. Take care not to hide any of the shorter leads by laying them all, if possible, flat on the board. Not only does it look pretty but also it is easy to follow.

If you are not able to use single-stranded wire I can suggest a few points that will help to ensure similarly good results as if you had. When measuring the spacing of the holes allow about an extra 3 or 4mm after stripping. Tin the twisted strands as usual and insert the ends into the holes. If the length is not quite right strip a little more off or start again, depending on whether you are long or short.

The wire should be slightly loose in between the holes now. When you come to solder the first end, hold it still in the hole and secure in position. At the other end grab the tinned end and, as you solder, pull it through gently. The insulation should soften and fold back against the top of the board. The wire should now be taut. The procedure in all the other aspects of construction are the same though.

When lines, such as those for power and external devices and control, are required to be taken off the board the most professional way is by an edge connector. However, many kits do not come supplied with these and they are sometimes expensive options.

The alternative to soldering directly into the board is to put single- or double-sided pins in the board and solder to these. This means that, so long as the job has been done neatly enough, the wires can be removed without moving the board if it has been screwed down. This, I have found, is the most cost-effective of all the options. It may also be improved by sleeving the connections with P.V.C. or silicon.

Last, but not least, our February gripe goes to a number of companies who modify computer boards. I must congratulate them for such a difficult job well done. The boards I have seen have mostly been U.K.101's but there are other conversions on the market for other makes. The worst one had been modified for increased memory for the screen in order to attach a high-resolution graphics board.

The bottom of this board looked like a plate of Italian spaghetti. The wires were very light gauge enamelled. By very light I mean 35 or 40 gauge. Somehow the board did work. However, there was no way of protecting the bottom of the board while in use and eventually there was one wire which came adrift. If only the company had sprayed the board with a P.C.B. laquer all would have been well.

Despite this setback the machine works perfectly now, with no problems except those of the programmer. He keeps forgetting that he now has 4K of screen memory so that his graphics just take up a quarter of the display!

BY KEITH MOTT

Make the most of your Sinclair ZX Computer...

Sinclair ZX software on cassette.

£3.95 per cassette.

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sinclair ZX81 SOFTWARE
BUSINESS & HOUSEHOLD 3
sinclair ZX81 SOFTWARE
GAMES 4
sinclair ZX81 SOFTWARE
sinclair ZX81
ORBIT
SNIPER
METEORS
LIFE
WOLF PACK
GOLF
1
sinclair ZX81

The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users.

Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes. Each program is carefully vetted for interest and quality, and then grouped with other programs to form a single-subject cassette.

Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions.

Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 – if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack.

This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM

The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack

The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 *and* the ZX80, it can be used for program storage or as a database.

The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 – Games

For ZX81 (and ZX80 with 8K BASIC ROM)

ORBIT – your space craft's mission is to pick up a very valuable cargo that's in orbit around a star.

SNIPER – you're surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

LIFE – J. H. Conway's 'Game of Life' has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

GOLF – what's your handicap? It's a tricky course but you control the strength of your shots.

Cassette 2 – Junior Education: 7-11-year-olds

For ZX81 with 16K RAM pack

CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

MULTIPLY – long multiplication with five levels of difficulty. If the answer's wrong – the solution is explained.

TRAIN – multiplication tests against the computer. The winner's train reaches the station first.

FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

ADDSUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 – Business and Household

For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it at home to keep track of 'where the money goes,' and at work for expenses, departmental budgets, etc.

Cassette 4 – Games

For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

TWENTYONE – a dice version of Blackjack.

COMBAT – you're on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

MAYDAY – in answer to a distress call, you've narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 – Junior Education: 9-11-year-olds

For ZX81 (and ZX80 with 8K BASIC ROM)

MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

VOLUMES – 'yes' or 'no' answers from the computer to a series of cube volume calculations.

AVERAGES – what's the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

TEMP – Volumes, temperatures – and their combinations.

How to order

Simply use the order form below, and either enclose a cheque or give us the number of your Access, Barclaycard or Trustcard account. Please allow 28 days for delivery. 14-day money-back option.

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Sinclair Research Ltd,
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To: Sinclair Research, FREEPOST 7, Cambridge, CB2 1YY *Please print*

Please send me the items I have indicated below.

Qty	Code	Item	Item price	Total
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	22	Cassette 2 – Junior Education	£3.95	
	23	Cassette 3 – Business and Household	£3.95	
	24	Cassette 4 – Games	£3.95	
	25	Cassette 5 – Junior Education	£3.95	
	17	*8K BASIC ROM for ZX80	£19.95	
	18	*16K RAM pack for ZX81 and ZX80	£49.95	
		*Post and packing (if applicable)	£2.95	
			Total £	

*Please add £2.95 to total order value **only** if ordering ROM and/or RAM.

I enclose a cheque/PO to Sinclair Research Ltd for £

Please charge my Access*/Barclaycard/Trustcard no.

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Name: Mr/Mrs/Miss

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CVG02

Sinclair ZX81 Personal Com
the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

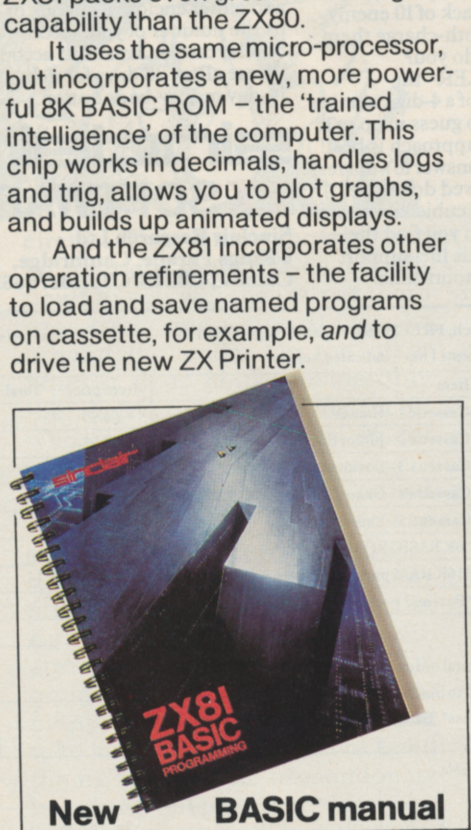
In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability
With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, *and* to drive the new ZX Printer.



Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.95

Higher specification, lower price – how's it done?
Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

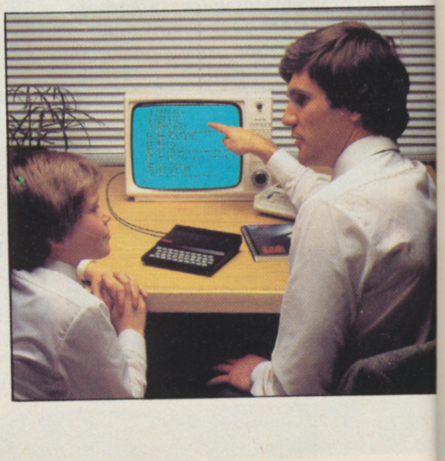
New, improved specification

- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: microprocessor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.

Built: £69.95

Kit or built – it's up to you!
You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



nputer-

sinclair
ZX 16K RAM
ZX PRINTER
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```
10 FOR I=1 TO 22
20 PRINT "/"
30 NEXT I
40 PRINT AT 10,0;"----------------"
50 FOR I=0 TO 63
60 PLOT I,22+20*SIN (I/32*PI)
```

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Available now- the ZX Printer for only £49.95

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alphanumerics *and* highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further intructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you *can* plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

How to order your ZX81

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

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Qty	Item	Code	Item price £	Order Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	49.95	
	Sinclair ZX Printer.	27	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

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CVG02

16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

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ZX81

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Sounds

BY DAVID ANNAL

Sound is an important selling feature of many of the new generation of microcomputers but it has not always been taken for granted.

Producing sound from a Pet, for example, is a simple process but many readers will not have realised, for example, that the Nibblers Pet game in the November issue, incorporated sound.

This method of generating sound was seen on several of the first and second generation microcomputers. Computers now mostly use dedicated chips producing 3 or 4 notes at the same time, controlled by specially invented Basic words such as "Music", "Tempo" and the like. Examples include the Dai, Atari, Sharp, and the new BBC computer. Note production is simple, eg. to play the note middle C one might simply enter a Basic line — 10 MUSIC C.

Many computers exist with no such refined system and it is these to which we direct our attention this month. Most, such as the Pet, have the necessary peripheral interface adaptors (PIA), or versatile interface adaptors (VIA), built in. If not, they can be added quite simply and memory addressed. To make matters clear, addresses given below are those used in the Pet but the principle involved is the same with any computer. A Basic POKE statement puts the number after the comma into the memory before the comma.

Information to be turned to sound and amplified comes down a single wire in the form of a series of "1"s and "0"s. The waveform and "tone" can be altered by the ratio of the number of "1"s to "0"s and their distribution. The frequency of the sound heard is governed by the speed of their production.

A simple way of achieving this, and the method employed in the Pet, is shown in diagram 1. The eight bit register is filled with a pattern of "0"s and "1"s, in the example shown, it would be the decimal No. 15. A control location is set so that the register is now shifted one place to the right under the influence of a timing circuit.

```
10 REM PROGRAM 1 — SINGLE NOTE
20 POKE 59467, 16
30 POKE 59466, 15
40 POKE 59464, 177
50 FOR D =1 TO 1000: NEXT D
60 POKE 59467, 0
READY.
10 REM PROGRAM 2 — ??
20 A =59467: B =59466: C =59464:
   N =250
30 POKE A, 16: POKE B, 37
40 FOR R =1 TO 8
50 FOR T =1 TO 200 STEP 3
60 POKE C, N-T
70 NEXT T
80 NEXT R
90 POKE A, 0
READY
```

Address	*Function*
59467	**Register Mode. 16 =Free running under timer control**
59466	**Main Shift Register**
59464	**Delay No. for timer countdown**

Each bit on reaching the end of the register is returned and inserted back at the beginning again but it also passes down the output line at the same time.

In simple terms, each "1" represents a voltage of 5V and each "0" a drop to 0V, so in our example, the output would be high for four shifts and then low for four shifts. This pattern is repeated as the register goes round and round and results in a square wave output (figure 2).

The frequency of sound output is made to vary by introducing a time delay before each shift takes place. In the case of musical sounds, the delays are very short and are set on the chip itself, which counts down from a preset number in one of its timing registers.

Diagram 1: Shift register at address 59466

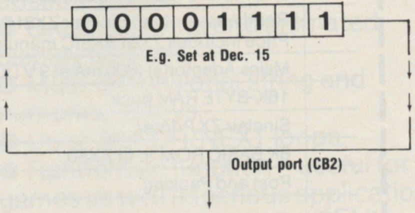
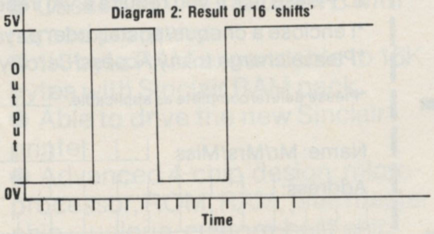


Diagram 2: Result of 16 'shifts'



Each time the loop reaches zero, the main register is shifted by one bit and the process is then repeated. We now have control of the pitch of the note produced by varying this delay number. The higher the number, the longer the delay in counting down, the slower the rate of stepping and thus the lower the note produced.

To obtain sound, the output line (CB2 from pin M of User Port on Pet) is simply connected to an amplifer such as that described in issue two and an earth return made to digital ground (pin N). It can be taken direct to your Hi-Fi but, in order to protect your computer from any short circuits or surges, it is always advisable to insert a resistance in series with the output line — one of 100K will suffice here.

Program 1 should now be easy to follow. First, in line 20, the VIA shift register is made free running under timer control as discussed above (several options exist but this is the most useful). Next, the shift register is filled with a pattern of "00001111" = 15dec. Finally the delay loop countdown is set at 117 to give a note of C. The delay in line 50 is a Basic one and governs how long the note will sound before it is turned off again in line 60. Note that the control of the shift register is built into the VIA chip (in this case a 6522) and so any computer can control it — only the memory locations allocated to the various control registers will be different.

What does Program 2 do? All kinds of effects are possible by using Basic to alter the byte in the shift register and the delay number.

A flick back to the Nibblers game on page 47 of the November issue. Note lines 10, 350, 430, 545 and 690. Their function should now be crystal clear!

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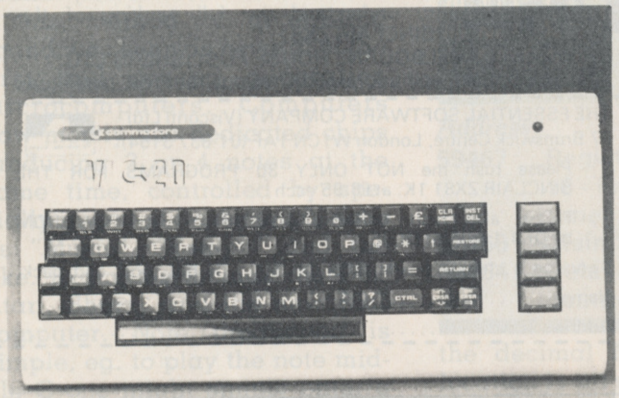

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ZX80 and ZX81

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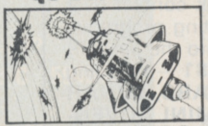
QS DEFENDER



Generally considered to be the best arcade type game available for the ZX-Computers
Up — Down — Thrust — Fire
First and only full screen display · Software to drive QS sound board · Moving planetary surface · Up to 84 fast moving characters on screen at once · On screen scoring · Ten missiles at once · Increasing attack patterns as the game progresses.

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Quicksilvas new arcade game

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ELECTRONICS FOR THE 80s

Graphics

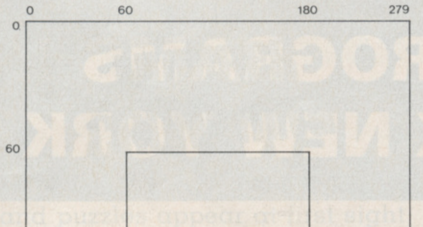
BY GARRY MARSHALL

Good graphics are so often the mark of a good game. So many computer games are given life by being hung around a theme — whether a destructive, you against the aliens struggle, or a tactical wargame scenario.

The more detail you can put into a graphical representation of the theme the more accurate the final result can be. High-resolution graphics is a popular option with computer games players. In this column we look at this facility on the Apple and Acorn Atom.

Good graphics add playability to games which are hung around a theme. And the more detail which can be included in a drawing, the more believable the game will be.

High resolution displays can be achieved with several microcomputers. These include Apple II and the Acorn Atom. The Apple II with Applesoft gives a resolution of 280 dots horizontally and 192 vertically, while the Acorn Atom with a full complement of RAM provides a resolution of 256 by 192. The high resolution graphics commands available on these micros include commands for moving the "drawing head" to any position on the screen, and for drawing a line from the current position to a position specified in the command.



The following program causes a rectangle to be drawn near the centre of the screen with an Apple.

```
10 HGR2
20 HCOLOR = 3
30 HPLOT 60, 60
40 HPLOT TO 60, 160
50 HPLOT TO 180, 160
60 HPLOT TO 180, 60
70 HPLOT TO 60, 60
80 END
```

Line 10 sets the high resolution graphics mode, line 20 sets the plotting colour to white, and line 30 plots a dot at the position in column 60 and row 60. Lines 40 to 70 cause the sides of the rectangle to be drawn. The location of the rectangle on the screen is shown in Figure 1.

In similar fashion, an Atom will draw a rectangle with this program.

```
10 CLEAR 4
30 MOVE 60, 60
40 DRAW 60, 160
50 DRAW 180, 160
60 DRAW 180, 60
70 DRAW 60, 60
80 END
```

Each line of this program is broadly equivalent to the line with the same number in the Apple program. There is no need to specify the plotting colour as the DRAW command automatically produces a white line. The point in row 0 and column 0 is at the bottom left of the screen with the Atom as opposed to the top left with the Apple.

Now, just as we have drawn a rectangle by joining four points together, we can draw any shape by joining a sufficiently large number of points. The more points we use, the more accurate the drawing will be. Outline programs for drawing any shape are given below. The Apple program requires the number of points to be joined to be given in the first data statement (in line 40) while the points themselves must be specified in the data statement at line 110. Other data statements can be included if necessary.

```
10 HGR2
20 HCOLOR = 3
30 READ N
40 DATA
50 READ X, Y
60 HPLOT X, Y
70 FOR I = 1 TO N
80 READ X, Y
90 HPLOT TO X, Y
100 NEXT I
110 DATA
120 END
```

A broadly equivalent program for the Atom is given below. Since Atom Basic does not possess READ and DATA statements, the program uses INPUT commands so that the number of points and the points themselves must be entered when the programe is run.

```
10 INPUT N
20 DIM X X (N), Y Y (N)
30 FOR I = 0 TO N
40 INPUT A, B
50 X X (I) = A; Y Y (I) = B
60 NEXT I
70 CLEAR 4
80 MOVE X X (0), Y Y (0)
90 FOR I = 1 TO N
100 DRAW X X (I), Y Y (I)
110 NEXT I
120 END
```

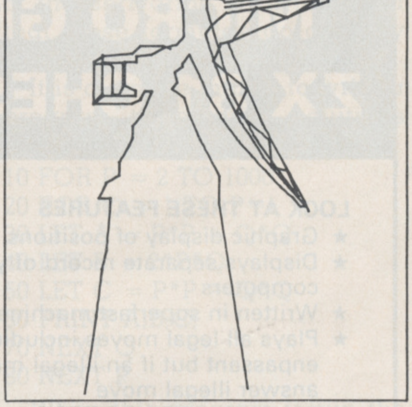


Figure 2 shows a drawing produced in the way described by these programs. It can be tedious to find all the points which have to be joined. A digitiser is useful to obtain the points in as painless a way as possible. There is a digitiser for the Apple.

By TED BALL

CONVERTING PROGRAMS

There is little more frustrating than reading about a marvellous game which is unavailable on your particular microcomputer.

And, unless you are familiar with the other machine's Basic, modifying the game to suit your computer is a daunting task.

Hardware and software vary so much that there are no general rules for converting programs; the conversion process may require anything from minor changes in syntax up to almost a complete rewrite, and the documentation provided may be anything from a bare program listing to a full explanation of the purpose of every section.

Manuals are usually available separately from the dealers who sell the machines, and if you intend to convert a lot of programs you will find it very useful to have many computer manuals.

In many cases the only changes needed, will be to the display on the screen. These changes will be needed because the memory addresses, the graphics characters, and the number of rows and columns on the screen differ among the various models of computer available. If you have the machine-dependent information on graphics and screen formats, which can be obtained from the manuals, and understand the techniques of memory-mapped screens explained in Garry Marshall's *Graphics* series you should have little difficulty in converting most programs.

Hardware differences, such as input from a joystick or light pen, or sound output, can cause difficulties. If you do not have these features on your computer, sound output can be omitted and joystick or light pen input replaced by input from the keyboard, but such changes may destroy the point of a game. If you do have similar hardware features the conversion is often straightforward, although you may sometimes have a lot of work to do because of the different software features available for controlling these peripherals.

Most dialects of Basic have a common core which varies little from machine to machine. Most of the differences are in the instructions for controlling special features, such as joysticks and colour graphics.

There are few differences in the syntax and operation of the most frequently used Basic statements and it is usually quite easy to make any changes that are necessary. Apart from special-purpose instructions used for controlling peripherals the only instructions likely to cause any difficulty are PEEK, POKE and USR.

The commonest use of PEEK and POKE is in memory-mapped graphics. Other uses may be concerned with the computer's firmware (the built-in machine code programs in ROM that control the operation of the computer). In this case you will have to find out what the instructions are

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doing and replace them with instructions to perform the same task on your own computer.

Some programs include machine code subroutines that are POKEd into memory and accessed by the USR or CALL instructions. Unless you are familiar with machine code or assembly language you are unlikely to be able to use such machine code subroutines, even if your computer contains the same microprocessor as the machine the routine was written for. Machine code subroutines often use the ROM routines, and even if they do not may use areas of memory that are not free on a different model of computer.

Although I have concentrated on the difficulties that can arise in converting programs, most of these difficulties occur only occasionally. Once you have got used to converting graphics from one screen format to another you will be able to convert many programs that you would otherwise not be able to use. However, you should be aware of the difficulties, particularly those features that you cannot convert, as this will save you much time.

NUMBER CRUNCHING

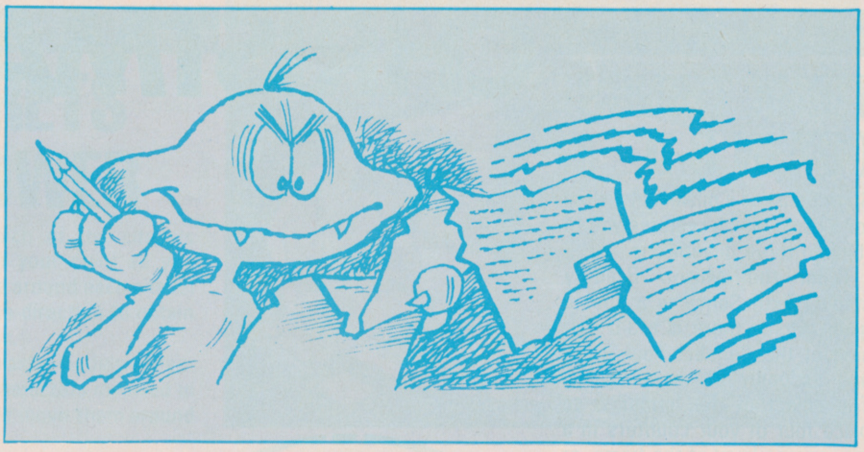
Many mathematical problems and puzzles appear at first sight to be suitable for computer solutions as they seem to be solvable by massive amounts of simple calculations even if you don't know the mathematical methods for solving the problems directly.

However, Basic works very slowly; although the result of a simple addition or multiplication may appear to be printed instantly, hundreds of thousands of such calculations will take hours. Thus it is usually necessary to reduce the amount of calculation needed, and it is often possible to do this with only elementary mathematics.

Let us look at the problem of finding whole number solutions of the equation:

$A^2 = B^2 + C^2$

There are, in fact, an infinite number of solutions, so we need to fix an upper limit to the solutions we are considering, say A=100. The obvious way to start is to test all triplets A,B,C less than 100, using something like the following:



```
10 FOR A = 1 TO 100
20 FOR B = 1 TO 100
30 FOR C = 1 TO 100
40 IF A*A< >B*B + C*C THEN 60
50 PRINT A;B;C
60 NEXT C
70 NEXT B
80 NEXT A
```

However, this took six-and-a-half minutes to find the smallest solution, A=5, B=3, C=4, and would take almost three hours to run to completion. It will also produce each solution twice; e.g. as well as A=5, B=3, C=4, it gives A=5, B=4, C=3, which is not really distinct.

We can make the program much faster, and eliminate the redundant solutions, by noting that A must be greater than B or C and we can arbitrarily chose to have B>C. Thus we need only test those cases where A>B and B>C. This could be done by inserting two extra tests between lines 30 and 40, but it can be done more efficiently by modifying the limits in the FOR . . . NEXT loops. If lines 10–30 are replaced by:

```
10 FOR A=3 TO 100
20 FOR B=2 TO A-1
30 FOR C=1 TO B-1
```

the running time will be reduced to 27 minutes, which is over six times as fast as the first version.

The problem does have a mathematical solution which can be derived very simply, although the details of the derivation make it too long to include here. The details of the solution can be found in almost any book on elementary number theory, and does not require any special mathematical knowledge for its understanding.

The solution is that all values of A,B,C satisfying

$A^2 = B^2 + C^2$

can be found from the equations

$A = P^2 + Q^2$
$B = 2*P*Q$
$C = P^2 - Q^2$

It is easy to see that this does give solutions, since

$A^2 = (P^2 + Q^2)^2$
$= P^4 / 2*P^2*Q^2 + Q^4$

while

$B^2 + C^2 = (2*P*Q)^2 + (P^2 - Q^2)^2$
$=4*P^2*Q^2 + P^4 - 2*P^2*Q^2 + Q^4$
$= P^4 + 2*P^2*Q^2 + Q^4$

The less straightforward part of the derivation is in the proof that these formulae do actually give *all* solutions.

It is a simple matter to write a program to produce solutions from the formulae above:

```
10 FOR P = 2 TO 1000
20 FOR Q = 1 TO P-1
30 LET A = P*P + Q*Q
40 LET B = 2*P*Q
50 LET C = P*P - Q*Q
60 PRINT A;B;C;
70 NEXT Q
80 NEXT P
```

When this program is run the solutions shoot up the screen too fast to read; values less than 100 come out in a few seconds, and within half an hour the program is giving solutions with six digits.

This shows the enormous advantage that can be gained by using a little simple mathematics to solve a problem, rather than relying on the "brute force and ignorance" method of the first program above, which will produce the answer but may tie up your computer for hours or even days.

CHRISTMAS 1982

WHAT'S IN STORE

The British toy industry spends January and early February unveiling its plans for the coming year. Here we present a selection of electronic games and toys which will be competing for our attentions next Christmas.

THINK THINGS OUT IN 3-D

Sixth Sense is a misleading name for a game which requires you to think in three dimensions.

From the Milton Bradley stable, Sixth Sense is a double game. Firstly there is a 3-D version of the Connect Four game and secondly a "maze" game. The object of the former is to place four of your counters in a row on one level of the frame, or to place four counters in a row on different levels.

Altogether there are four layers of the frame in which to place your counters with a total of 16 spaces. The counters you play with are actually square shaped cubes which slot into each space.

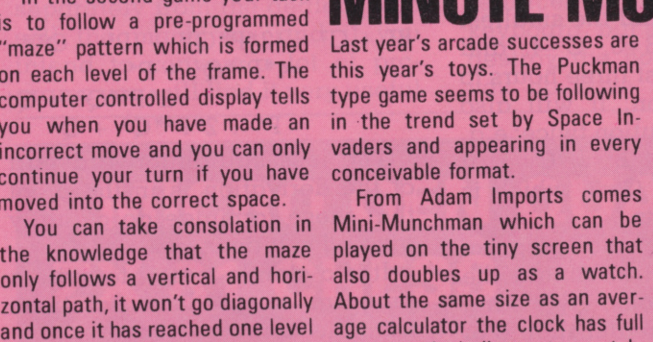
Remember to check the counters on the bottom level of the centre section which are difficult to see when they have been built upon. When one of you finally wins a victory tune plays.

In the second game your task is to follow a pre-programmed "maze" pattern which is formed on each level of the frame. The computer controlled display tells you when you have made an incorrect move and you can only continue your turn if you have moved into the correct space.

You can take consolation in the knowledge that the maze only follows a vertical and horizontal path, it won't go diagonally and once it has reached one level it will not descend again.

The winner of the game is the first person to reach the end of the maze. Sometimes you might have to use your opponent's counters as a scaffold to climb to the right level in the maze. Each player is given the same number of moves to complete the maze.

Sixth Sense is scheduled to be on sale in most large toy shops from July of this year and will cost £17.59.



MINUTE MUNCHMEN

Last year's arcade successes are this year's toys. The Puckman type game seems to be following in the trend set by Space Invaders and appearing in every conceivable format.

From Adam Imports comes Mini-Munchman which can be played on the tiny screen that also doubles up as a watch. About the same size as an average calculator the clock has full functions, including a stop watch, an alarm, lap timer, day and date.

There has been a plethora of hand-held Munchman type games but this is the first to be used in the pocket watch format.

The game itself sticks closely to the original version with the player in control of a munchman who rushes around the screen eating dots as he goes.

Mini Munchman's makers Adam Imports anticipate supplies should filter into the shops in March retailing for about £18.

In the same series, is a golf game which will also cost £18.

This game again is unique for the range. You control a golfer who has to swing his way through a nine hole course. It has little features incorporated into the game to give the player more information, like figures displaying the distance the ball is away from the hole he is playing.

Adam Imports says that the skill of the game is pressing the button at the correct time when the golf club is on the back swing.

SOUPED-UP SPACE INVADERS

A sophisticated space invaders hand held game will grace shop shelves later in the year keeping the craze lingering on.

Called Alien Attack, the object is to shoot down as many aliens as you can. You have three firing ships fitted with lasers to blast at your attackers. At the start of the game the aliens move onto the corners of the L.C.D. screen and home in on your space ships, firing beams as they fly. The "meanies" come in waves of six, but once you destroy those there is no let up — another batch will be instantly sent on the rampage.

COLECO
Alien Attack

There are two skill levels and many different speeds to master.

Alien Attack is one of Peter Pan Plaything's new toys for 1982. It was originally released in America and is made by US toy firm Coleco. The game does however fall at the top end of the price range retailing at around the £50 mark.

CHIPS ARE CHILD'S PLAY

A treat for children with a taste for music will be in store mid-year.

On a touch sensory surface, children can learn to play and sing along to their favourite stories with this new electronic toy. The microprocessor hidden inside the toy memorises the tunes and when the correct coloured button is pressed the corresponding note is emitted. Called the Musical Story Book, the toy has two different octaves and an automatic shut-down device, acting as a power saver in case of forgetful children — who leave it on.

Coming in a square shaped case, the board consists of 64 keys which represent the note played. At the top of the eight columns the letter of the note is stamped in large letters making it easy for the child to read.

With the actual toy comes a selection of cards on which the stories are written. To play the tune the child reads the card following a "road" map consisting of lines linked up by circles containing the correct musical note.

Included in the list of musical stories are Happy Birthday and Ba Ba Blacksheep.

Peter Pan Playthings is the firm behind this toy and has assigned it a price of £16. It is due in the shops in July and runs off one nine volt battery which is not included in the package.

LEARN THE SECRETS OF THE DARK TOWER

Leading a band of warriors to overthrow the forces of the brigand king who has stolen a people's precious sceptre is the theme of a new concept in games.

Dark Tower is a unique idea combining a traditional board game with an electronic game. The centrepiece is the tower itself which is mounted in the middle of the playing board. That is the microprocessor controlled part of the game. At the front of the tower is a large "window" which acts as a screen and shows each player what is happening to his troops.

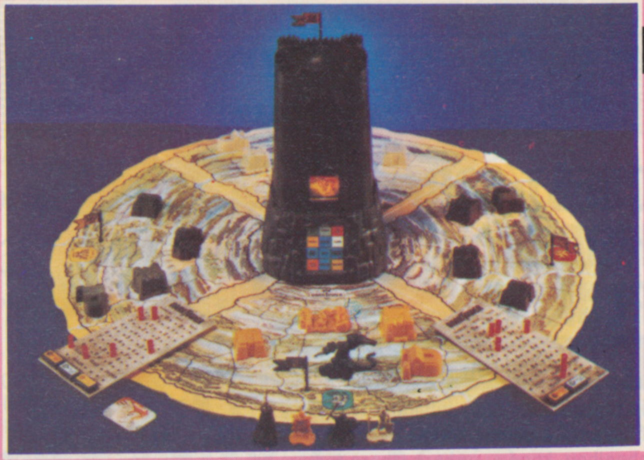
On the board are marked four citadels containing a tomb, a sanctuary, a bazaar and ruins which each player occupies for the duration of the game. The ultimate aim is to attack the Dark Tower and oust the evil brigand king.

But to do that you must find three keys made of brass, silver and gold and solve the riddle of the keys. These vital objects are hidden in each of the citadels (but none in your own) so you have to move around each citadel in a clockwise direction to obtain the treasures.

You use plastic models to represent the characters involved in the game and move them around the board.

At the beginning of the game, each of the four players is allocated 10 warriors, 30 bags of gold and 25 food rations. Anything can happen to you on your travels and you must watch out for hidden dangers which might befall you and your soldiers. Like the fire-breathing dragon which you could run into, or the fatal plague that can kill off half your army. Sometimes you will inevitably have to set to battle with some of the other brigands in pursuit of their keys.

Throughout your military campaign you must keep an eye on how many food rations you have left for your warriors. Hungry soldiers aren't much good in an exhausting battle.



You can replenish your supplies in the bazaars using your gold, and you can even haggle to bring the price down if it's too high.

To make a move in the game you must press one of the buttons on the tower's control console — there are 12 in all — to indicate where you want to move to. After you have pressed a button a response and further directions will flash up on the screen for you to follow. The tower swivels round so that only the player whose turn it is can see what the window reveals.

Once you have found the keys you still can't rush in and storm the Tower. First you have to solve the riddle of the keys for only then will the portcullis open allowing you to lay seige. If you win the tower plays a victory tune and the retrieved sceptre is held high in triumph. Before marching into battle make sure you have enough troops to stand a good chance of success.

This Milton Bradley game has the potential to be one of the most sought-after of 1982, and is certainly one of the most imaginative of this year's batch of new launches. It will be on sale later in the year for £30 from most large toy shops.

MAGNUS' MICRO RIVAL

Practise snapping back answers to general knowledge questions from a know-all toy which would give Magnus Magnusson a run for his money.

Joining in the **Mastermind** test of general knowledge, this new toy is designed for the entire family. Altogether there are 19 different subjects for you to answer questions on when you play Family Challenge. This microchip controlled game poses a total of 1,001 questions and contains a number of special features.

You can begin the game's play on any question you choose by pressing the selection button, so if you don't fancy your chances on the one first posed you can pick another.

If there are several difficult questions in a row you can use the fast forward button to advance the process quickly. Lights and sound help brighten it.

The U.K. distributor is Peter Pan Playthings of Peterborough and the game will retail at around the £50 mark. Family Challenge is the big brother of Master Challenge also made by Peter Pan.

A booklet of new questions for Master Challenge is also new out. Altogether there are 1,001 questions based on popular television quiz programmes like **Ask the Family**, **Mastermind** and **A Question of Sport** All for £6.75.

The booklet contains quiz questions and can be used with the new game. Family Challenge is battery run, but they are not supplied with the toy.

1001 ways to have family fun in the great new
Family Challenge
Family Challenge

A GAME TO SINK YOUR TEETH INTO

Your blood will start to curdle when you sink your teeth into Dracula.

When your fingers touch the chilly casing of the electronic game Dracula, you are confronted by the plan of a haunted house. You have to find your way through the house avoiding the obvious dangers of coffins (which could contain cousins of Dracula), and that particularly poisonous type of bat which flies in heavy numbers through haunted houses.

Dracula is an extension of the range which Adam Imports brought out last year. It will be available in a plastic casing, consisting of a flat console where the control push buttons are located and a screen for the player to look at displaying the action of the game.

The object of Dracula is to steer clear of the dracula symbol, for obvious reasons. If you get too close to his fangs . . .

Unfortunately, it won't be in the shops until July at the earliest and is due to retail at just under the £30 mark.

Astroblaster is the new, improved version of Adam Imports' Astro Wars. It is in the same vein as that game but follows the arcade game Scramble. On the horizontal display you see an undulating lunar surface which constantly changes as your aeroplane flies above.

Various alien space craft and creatures fly towards you at intermittent periods. You score points by successfully shooting down the enemy ships and by blasting the ground bases.

Astroblaster is also expected to sell for just under £30 and should be on shop shelves at about the same time as Dracula.

QUEST FOR HIDDEN PLUNDER

PIRATE ISLAND

Pirates are common inhabitants of adventure games and as every schoolboy knows: where there are pirates, treasure is never far away.

Supplied on a C12 cassette, Pirate Island loads in two parts corresponding to the two memory blocks of the Atom and during the second load instructions are presented on the screen.

This gives you something to look at while waiting for the cassette to finish the load.

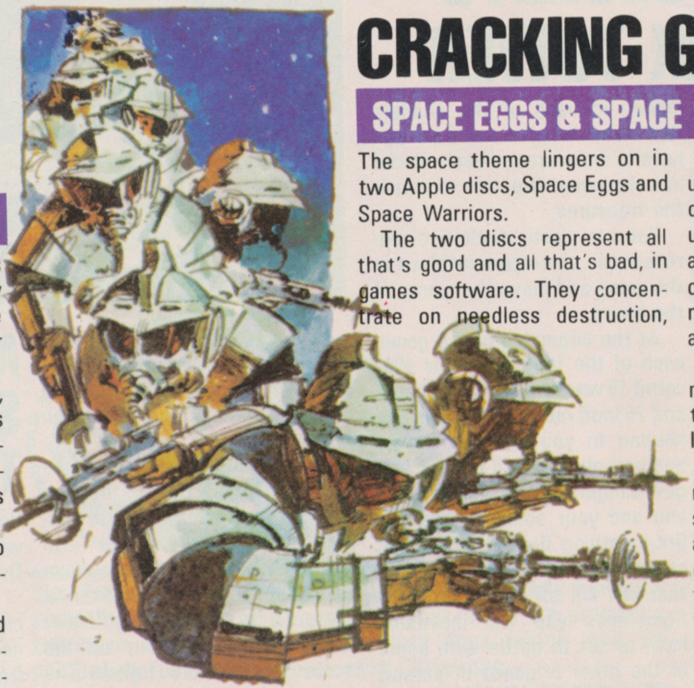
The object of this fast and exciting game, is to collect various items of treasure and transport them back to your ship while avoiding many obstacles and hazards placed in your path.

In common with other adventure games, the computer recognises commands typed in English such as "North", "Up", "Eat the Sandwich" and so on.

The machine replies with "I can't" or "I don't understand" if the command is not recognised or incorrectly phrased, and allows another attempt.

There is a small screen flash after each input, but it is of very short duration and after a short while becomes unnoticable.

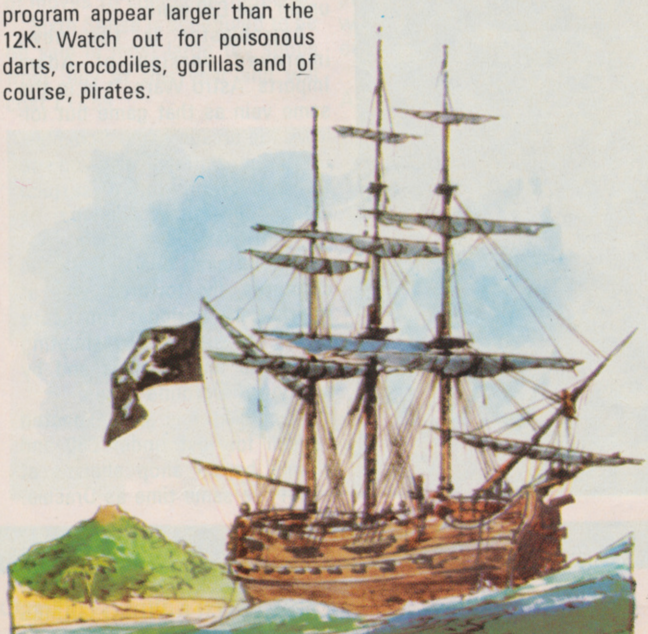
Altogether there are over 30 locations and more than 25 objects which will be required during your hunt for treasure. This is achieved by using only five bits per character instead of the usual eight, thus making the program appear larger than the 12K. Watch out for poisonous darts, crocodiles, gorillas and of course, pirates.



Useful things to pick up are a tinder box, pieces of eight, a knife and a green eyed golden idol.

Pirate Island is an easy and compulsive game to play, but requires skill and a certain amount of luck to get the best score which is shown at the end of the game. Yes, the best score, 16 out of 16, is possible!

The program is written in machine code and uses up the whole 12K RAM of the expanded Acorn Atom, it is available from Hopesoft of Newbury in Berks. An excellent piece of software it is well worth the £6.75 price-tag.



CRACKING GRAPHICS

SPACE EGGS & SPACE WARRIORS

The space theme lingers on in two Apple discs, Space Eggs and Space Warriors.

The two discs represent all that's good and all that's bad, in games software. They concentrate on needless destruction, but use fantastic graphics.

Space Eggs can be found in the arcades under the name Moon Cresta.

The game is a variation of the usual space invaders theme whereby the player has a joystick type control to move the space ship from left to right, and a fire button. Three levels of difficulty are present.

A three part space ship splits up, giving you three attempts at destroying the eggs. Unlike the usual games, when you destroy an egg a space-thing appears out of it with a number on it. The number indicates the points awarded if you hit it.

Unfortunately the space-thing moves very erratically, usually in the direction of your space ship. If it touches you then that's it.

Space Warrior involves the rotating joystick to move a static spaceship that is surrounded by a force field. Attacking space craft are destroyed by lining up the space ship and pushing the fire button. Again the space craft follow erratic paths making defence difficult.

Marvellous graphics and a familiar space battle theme, the games rely purely on speed and reactions but they seem to give hours of enjoyment to those in early teens and younger.

Both are available from Pete and Pam Computers for £13.95 each, to run on an Apple II. For Space Eggs you need 48K memory and 32K for Space Warrior.

WHISKED INTO ACTION

ARCADE SCRAMBLE

There's plenty of action when your craft takes to the skies in Arcade Scramble. And the good graphics make this arcade spin-off a cut above most others.

The mission theme which gave Scramble a big arcade following is recreated with plenty of hazards for the player's plane.

You have six controls which use the arrow keys (or letter keys if you wish) to alter your altitude, give forward and reverse movement, drop bombs and fire your guns.

The game is written in machine language, and after loading it via the system command and seeing the title page you are given a cross section representation of the enemy territory with mountains, valleys, rocket launching pads, ack-ack pads, forts, munition dumps and fuel dumps.

Your plane flies across the screen whilst the ground unfolds beneath you from right to left. Using the controls, bomb the enemy posts without flying into the landscape. Further hazards include: enemy missiles, clusters of blimbs in the air (which you must avoid) and ack-ack from enemy gun posts. Without warning, enemy aircraft appear to intercept you and you either have to dodge or shoot them down.

The game is not difficult to learn but does take some practice to achieve a satisfactory score. Should you have a suitable amplifier connected the game provides arcade type sound effects.

The game runs on a TRS-80 Model 1 and a Video Genie and the cassette costs £9.50 from Kansas City Systems.

TEAM 4 SOFTWARE

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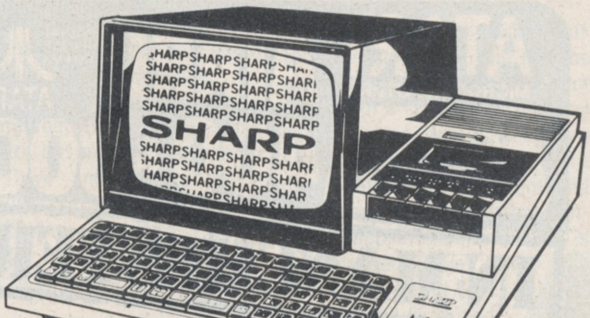

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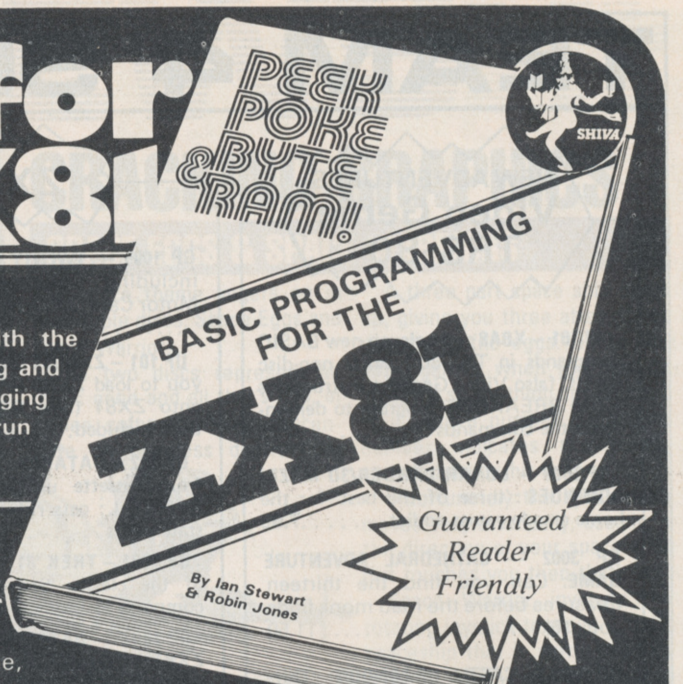
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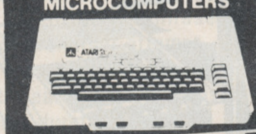

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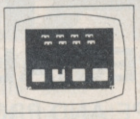
1K Space Invaders



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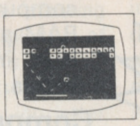

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DANGER IN THE DEPTHS

HALLS OF DEATH

Down into the depths to face danger and earn your rewards, the standard adventure game format is relived in Halls of Death.

The object of the game is to explore the various cave levels of the Halls of Death, collecting treasures and slaughtering monsters before you are killed.

If you do manage to get out you are given a rating based on the treasures you have been able to retrieve and the monsters you have killed. The deeper you go, the nastier the monsters (watch out for that Mummy) and the greater the treasures that can be found. I liked the Dragon!

Movement around the levels is via the number pad in the usual manner; other commands are prompted on the screen — usually requesting the pushing of one letter or another. The program generates a player for you with certain characteristics. There is an option of saving characters at the end (if they survive) and reading them back into the game, to continue playing next time.

One of the best features of the game is the combat, which has a realistic points system. If you remain undecided on what to do, your opponent carries on fighting — usually with nasty results.

Watch out for some special effects from some of the monsters — it pays to run from some of them.

You can try out spells too, but you don't know what they do until you try them. They turn out to be sleep, teleport, lightning bolt, fireball — woe betide you if you don't have enough spell points when you start using them!

One fault the game has is that it is possible to ruin the map on the screen if you push the wrong key in spell use, but this is a minor fault in a game that I found quite compulsive, expecially as I tended to get killed at the most interesting point! It runs on a Pet in 16K and costs £14 from Supersoft of Middlesex.

FENCING WITH ALIENS

SPACE INVADERS AND PINBALL

Spacewar brings the alien invaders back to your screen but puts them behind a wall.

This cross between Space Invaders and Breakout has kamikaze alien spaceships trying to knock bricks out of a wall which it is up to you to defend.

Every 1,500 points a new barrier magically appears to replace the old battered one.

Your resources amount to five laser bases, which seem pretty meager when compared to the alien commander, who has 400 craft at his disposal.

If you manage to destroy all the aliens a message appears telling you what a hero you are. But there is one small bug in the program, when the last base has been destroyed the firing sound effect still continues whenever you press the fire key.

On the same Acorn Atom cassette is Pinball, a version which is the best I have yet seen on a computer. The game uses low resolution graphics and needs 5K of text space memory, so it will run on a semi-expanded Atom.

In this version of Pinball, the table has been put on its side so that the flippers are on the left hand side of the screen rather than at the bottom. This makes the game slightly more difficult to master if you are used to playing on normal pinball machines but you should soon get used to it. The game becomes very fast moving and a great amount of skill and concentration is required to get a good score. You are allowed up to nine balls with which to try to get up to 999,990 (you'll never do it) although a score of about 100,000 is quite reasonable.

Neither of these games need a floating point ROM. On the same cassette but more disappointing are, Drive and Letters which make up the four games. Still at only £5 from Timedata I would strongly recommend this cassette to all Acorn Atom users.

BOUNDARIES, BOWLERS AND STATISTICS

MINI-CRICKET

If there is a statistical game that the ZX81 would be good at, it must be cricket. Unfortunately Mini-Cricket only makes a fair effort at simulating the one day game.

Mini-Cricket is a game for two players against each other or one player against the computer. On loading the program the ZX81 asks you what type of game you want to play, one or two players? The computer then goes on to ask you to name your team and the 11 players in it, of these, four bowlers must be nominated. The computer tosses a coin and tells you if you are batting or bowling.

The main display, a scorecard, is then printed up on the screen. You are asked to nominate a bowler for the first over, or — if you are batting — whether, you want to attack or defend.

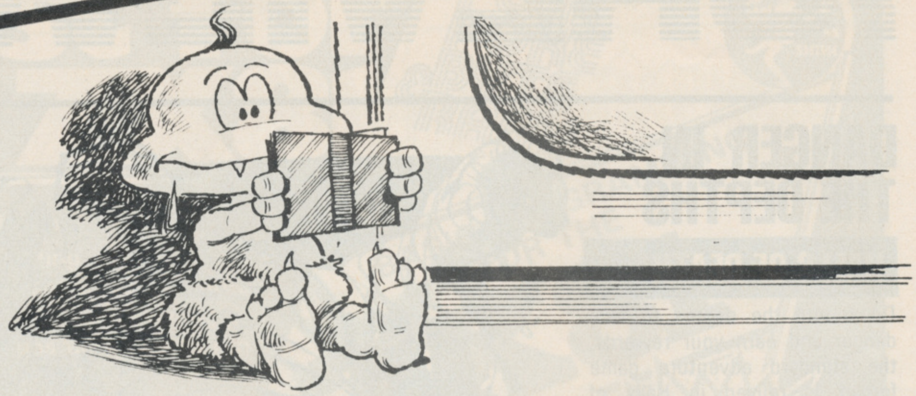
This happens every over and there are 20 in each innings. Bowlers nomination is necessary as some bowlers are better than others. Those two choices are the only ones you are allowed to take and make the program slightly disappointing in that respect.

After making your decision the scorecard will alter every ball to tell you who is batting, how many runs were scored off that ball, alter the team total and update the bowlers' figures. If it is the second innings, you are told what the opposition had scored at the same point in the first innings, a nice touch that adds a bit of excitement. If the scorecard flashes "Owzat" you have to wait for the umpire the ZX81 — to make a decision.

Unless you are a cricket buff, this is a game that will only be played now and again. It is not enough of a simulation to replay actual games and is therefore slightly disappointing. The documentation is excellent and stands as a target for other software suppliers. Mini-Cricket is available from Emvee Software of Lytham in Lancs., and is priced £5.95 and needs 16K of memory.

DOWN TO BASIC

BY MOIRA NORRIE



GIVE LUCK A CHANCE

Most games involve some element of "chance" or "luck". This element of chance is introduced into a game by actions such as rolling dice, shuffling cards or spinning a wheel.

For any such action, we know that each of the possible outcomes is equally likely to occur. When you roll a dice, you may get a 1, 2, 3, 4, 5 or 6. The chance of getting a "1" is no different from that of getting any other of the numbers. By the action of rolling the dice, you are selecting one of the numbers at random. I will now show you how you can introduce this idea of chance in your programs.

In Basic, there is a function RND which selects numbers in the range of 0 to 1 (not including 1) at random. Every time the computer encounters ("RND" in a basic program, it will select another number between 0 and 1. To illustrate this, try running the following program

```
10 FOR I = 1 TO 20
20 PRINT RND
30 NEXT I
40 END
```

A list of 20 numbers, each in the range of 0 to 1, will be printed. They will appear to be selected randomly in that they will not follow any obvious pattern. In fact, these numbers have been generated by the computer using a mathematical rule which produces a list of numbers with this property of "randomness". This mathematical rule is called a "Pseudo-Random Number Generator" — meaning that it generates numbers that appear to be random.

Different computers use different Pseudo-Random Number Generators. As a result, the operation and format of the RND function varies slightly from one computer system to another. On many systems you have to include a value in brackets after "RND" — for example, RND(1). The operation of the RND function will depend upon the value given in brackets.

Later, I will give some examples of the effects of different values for some of the popular personal computers that adopt this format. For the moment, it suffices to say that on most of these systems replacing line 20 of the previous program with

```
20 PRINT RND(1)
```

should give a program that will generate a list of random numbers — each lying between 0 and 1.

THE ROLE OF THE DIE

How can you use this function RND to simulate rolling a die in a game? The function RND provides us with a number in the range 0 to 1. We require some way of converting this to one of the digits 1, 2, 3, 4, 5 or 6. Let's examine the conversion process step by step.

If RND gives a number in the range 0 to 1 (not including 1), then 6*RND will give a number in the range 0 to 6 (not including 6). By adding on 1, we would then have a number in the range 1 to 7 (not including 7).

For example: if RND would give 0.217873; then 6*RND would give 1.30724; and 6*RND+1 would give 2.30724.

By using 6*RND+1 we can generate numbers in the desired range, however, we are only interested in the "integer part" of these numbers i.e. the part before the decimal point.

in Basic, there is a function INT that provides the "integer part" of a given number.

INT(3.25) is 3 as 3.25 can be expressed as 3+0.25
INT (−2.6) is −3 as −2.6 can be expressed as −3+0.4

From the second of the examples above, you can see that the function INT is not quite so straightforward when dealing with negative numbers. However, in our case, we are only interested in positive numbers. When the value is positive, the operation of INT can be described as returning the part of the number before the decimal point and ignoring the rest.

The following program will simulate rolling a die 20 times and print a list of outcomes.

```
10 FOR I = 1 TO 20
20 PRINT INT (6*RND+1)
30 NEXT I
40 END
```

A similar program could be produced to simulate a roulette wheel by using INT(37*RND) — remember, the possible outcomes are 0, 1, 2, . . . 36.

Clearly, these programs are not of much interest on their own. Later in the series I will show how they can be included in a games-playing program.

If you try running the previous programs more than once, you will find that they always produce the same output. A computer game would soon become very boring if it always used the same random numbers each time it ran. We need to be able to adapt the Pseudo-Random Number Generator so that it will generate a different sequence of random numbers each time we use it.

It is this aspect of Pseudo-Random Number Generators that tends to vary greatly from one system to another. I will describe the most common alternatives.

In those systems where the function is simply expressed as "RND", there will be a keyword RANDOMIZE or RAND that can be included in a program before the first RND function. The inclusion of a line containing the appropriate keyword will result in a different set of random numbers being generated each time the program is run.

On the Sinclair ZX81, my program for "rolling a die" could be adapted to:

```
10 RAND
20 FOR I = 1 TO 20
30 PRINT INT (6*RND+1)
40 NEXT I
50 END
```

When I introduced systems that used the format RND (1), I stated that the operation of the Pseudo-Random Number Generator depended upon the value inside the brackets.

On the Commodore Pet, a program using RND(1) will produce the same random number sequence each time the program is run, whereas RND(0) will result in a different sequence each time the program is run.

On the Atari, the use of RND(1) will produce a different sequence of random numbers each time the program is run, Rather than being used to generate a sequence of random numbers, RND(0) returns the value of the most recently generated random number.

It is a great pity that all the systems are so inconsistent!

There are situations when you will wish to select alternative sections of your program depending upon the data input or, perhaps, the value of a random number. Such selections can be made by using an IF statement to test whether a specified condition is true. If the condition is true, then a "jump" is made to a particular section of the program. To illustrate the use of an IF statement I will consider a very simple example.

TOSSING A COIN

How can we write a program to simulate tossing a coin — the possible outcomes being a "tail" or a "head"?

The function RND selects a number between 0 and 1 at random. It is equally likely that the number will lie in the lower half of the range or the upper half of the range. Similarly, when you toss a coin, it is equally likely that the outcome will be a "tail" or a "head". We may therefore decide that if the random number is in the lower half of the range, it represents a "tail"; and if it is in the upper half of the range, it represents a "head".

Our program would therefore take the form

```
if RND < 0.5 then
          print "TAILS"
     otherwise
          print "HEADS"
end
```

We therefore have two alternative sections in the program — either we print the message "TAILS" or we print the message "HEADS". If the condition that RND <0.5 is true, then we print "TAILS".

```
10 IF RND <0.5 THEN 40
20 PRINT "HEADS"
30 GOTO 50
40 PRINT "TAILS"
50 END
```

If the condition RND <0.5 is true, then the computer will "jump" ahead to line 40. If the condition is not true, then the jump will be ignored and the computer will continue, as normal, with the following line — in the above example it will go to line 20.

In the case where "HEADS" is printed, the computer must "jump" over line 40 — otherwise the message "TAILS" would also be printed. This is achieved by using a 'GOTO' statement. A GOTO statement simply specifies the line number the computer will "jump" to.

The IF statement is sometimes referred to as a "conditional jump" while the GOTO statement is sometimes referred to as an "unconditional jump".

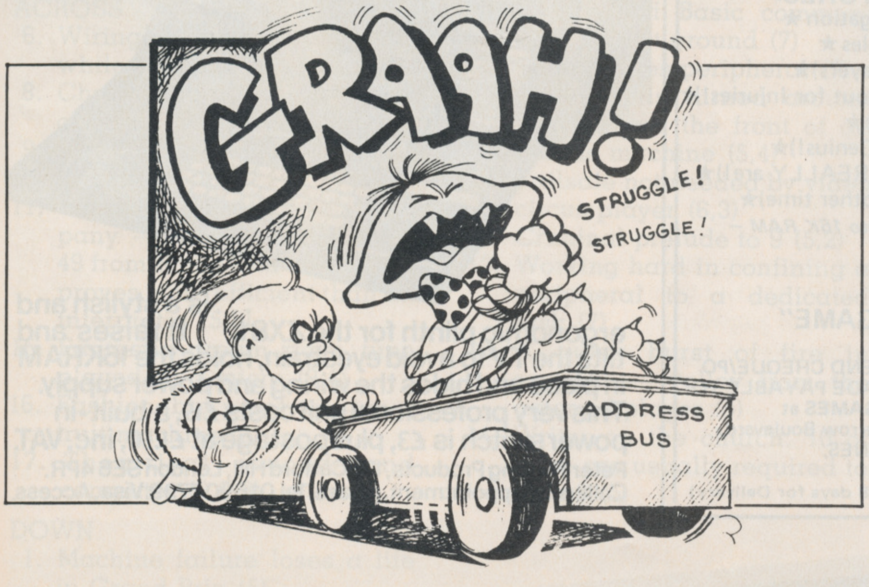
NEXT ISSUE SOLVING PROBLEMS

I have briefly introduced the IF and GOTO statements. Next month, I will describe the use and format of these statements in more detail.

The programs discussed so far have been very simple. You have the knowledge to write reasonably complex programs — it is now just a matter of gaining experience in using that knowledge.

I will work through the steps involved in developing a program for a specified problem next issue.

NEXT ISSUE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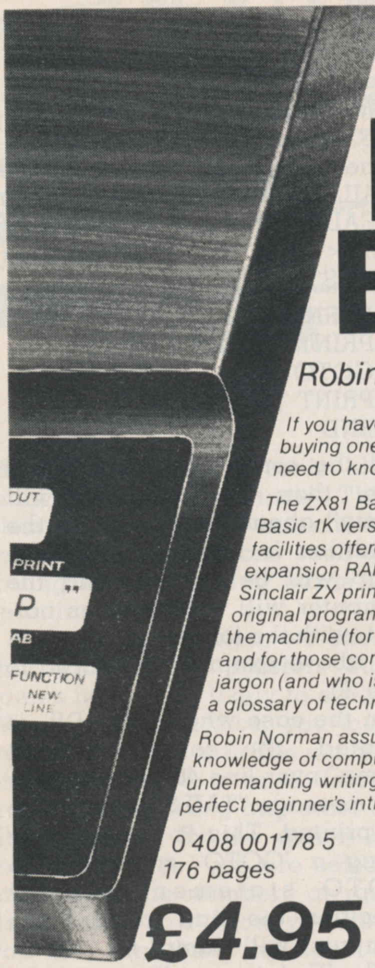

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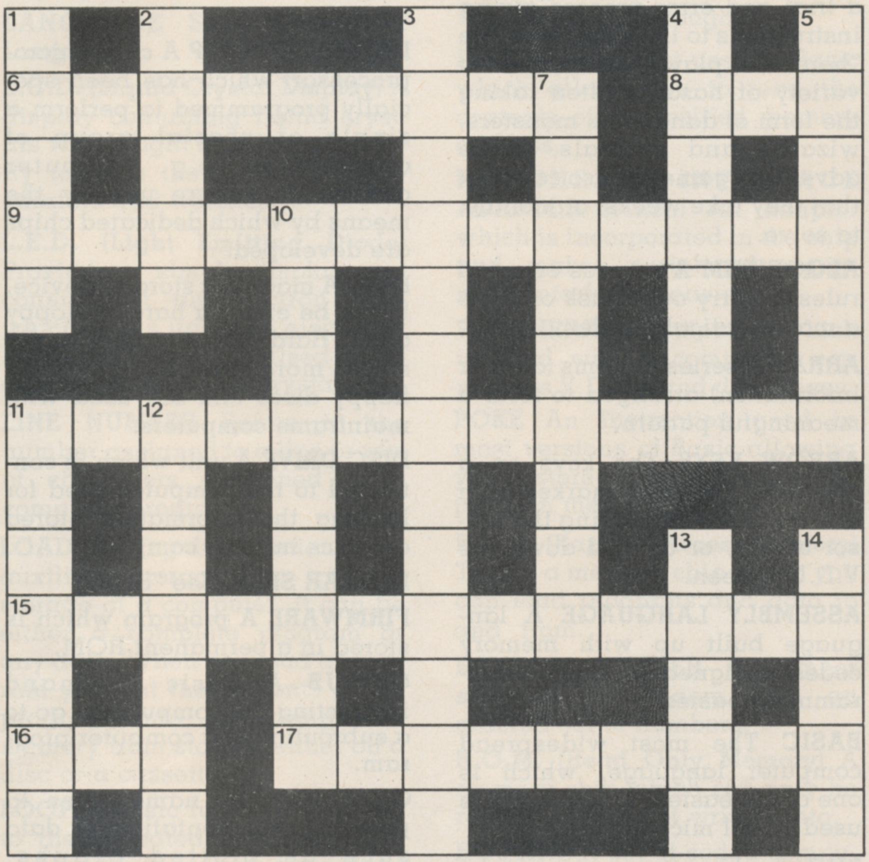
The factorial of a number is given by the formula n factorial (denoted as n!) = n x (n-1) x . . . x2x1

Example 3! = 3x2x1 = 6
4! = 4x3x2x1 = 24

What are the lowest 3 consecutive whole numbers whose factorials each have the property that they contain the digits 0-9 in order.

● Bottles of champagne go to G. Kitchen of Deepcar, Sheffield and E. M. Weston of Tadley, Hants, winners of December issue's Mind Routines and Nevera Crossword puzzles. More champagne is up for grabs this issue.



NEVERA CROSSWORD

ACROSS

6. Wiring the equipment again while saving the program (9)
8. Character lost from the front of the tape is fishy (3)
9. Video version of Escape from Colditz? (5,8)
11. Graduate with such company — Margaret Thatcher, 49 from Rome and the Queen proves more efficient than an interpreter (5,8)
15. Fantastic dream gave tune played on a micro (9,4)
16. Fashionable point to play a fruit machine (3)
17. Theatrical second-hand computer (3,3,3)

DOWN

1. Machine failure loses a life in Grand Prix (5)
2. CDC operating system with potential (5)
3. True comic romp around the hardware (13)
4. Deletion of Basic comment on a cricket ground (7)
5. Guy Fawkes peripheral (7)
7. Gas Panels turned around might cover the front of an arcade machine (5,4)
10. Failsafe not needed by video circus player (6,3)
11. Criminal prelude to 9 (5,2)
12. Working hard in confining a peripheral to a dedicated task (7)
13. A quick burst of fire in reprisal — volley from the asteroid player (5)
14. Writer on the church. 10 of them are usually required to play 9 (5)

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SOFTWARE GLOSSARY

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ADVENTURE A type of game in which the player has to take a character role and retrieve a number of treasures or objects by a trial and error process giving instructions to the computer. The "hero" (or player) encounters a variety of hazards often taking the form of dangerous monsters, wizards and animals. Some adventure games are so complex that they take weeks, or months, to solve.

ALGORITHM A process or set of rules to carry out a task or solve a mathematical problem.

ARRAY A series of items (data or information) arranged to form a meaningful pattern.

ARROW KEYS The keys on a computer keyboard marked with arrows. Used for moving the cursor across, or up and down the V.D.U. screen.

ASSEMBLY LANGUAGE A language built up with memory codes designed to make programming easier.

BASIC The most widespread computer language, which is one of the easiest to learn and is used on all microcomputers.

BUG A slang term given to a mistake in a computer program which prevents it from working. It can refer to a mechanical, electrical or electronic defect in a computer.

CHIP A tiny piece of silicon which holds all the components that make up a microprocessor.

**CHR$** A Basic function which codes a computer's graphic symbols. It is followed by a number in brackets, e.g. CHR$ (68), which is the coded number of the symbol you want the computer to produce.

COMPUTER LANGUAGES Languages are used to make the computer perform operations. They consist of computer instructions or commands. There are different types of languages for carrying out different tasks, e.g. business, scientific.

DEBUG The process of locating and correcting errors in a computer program.

DEDICATED CHIP A chip (microprocessor) which has been specially programmed to perform a single or special group of applicatons, e.g. computer games. ROMs are usually the means by which dedicated chips are developed.

DISC A magnetic storage device. It can be either a hard or floppy disc. Hard discs can usually store more information than floppy discs and are used with mainframe computers.

DISC DRIVE A unit which is connected to the computer used for loading the information stored on discs into the computer.

DOLLAR SIGN See "String"

FIRMWARE A program which is stored in a permanent ROM.

GOSUB A Basic command instructing the computer to go to a subroutine in a computer program.

GRAPHICS The name given to pictorial representation of data such as plotted graphs, engineering drawing and, of course, computer games.

HARDWARE The general term given to all pieces of electronic and mechanical devices which make up a computer system, i.e. the actual machines.

HIGH RESOLUTION GRAPHICS A method of using Basic commands to move a drawing head to any position on the screen and drawing a line between two specified points. This facility is available on several makes of microcomputer.

INPUT Information/data which is fed into the computer.

INTEGER A number which does not contain a decimal point, i.e. a whole number.

K Abbreviation for Kilobyte.

SOFTWARE GLOSSARY

A beginner's guide to plain jargon

KILOBYTE A measurement of memory capacity. 1024 bytes of memory. So 8K is equivalent to 8192 bytes.

LANGUAGE See "Computer Language".

L.C.D. (Liquid Crystal Display) A display containing liquid crystals which light up when electricity touches them. Used in calculators and watches.

L.E.D. (Light Emitting Diode) Provides a simple display and consists of an electron tube which lights up when electricity is passed through it. Used as an alternative to liquid crystal.

LINE NUMBER Refers to the number assigned to a line or row of characters contained in a computer program.

LOAD Putting information from auxiliary storage into internal storage of a computer. It can be either a complete program or any data. When you load a program you put the contents of the program into the computer's memory from storage either on a disc or a cassette.

LOOP A Basic function referring to the repeated execution of a series of instructions for a fixed number of times.

MACHINE CODE The term used to refer to symbols or numbers assigned to parts of a machine. It is the same as operation code which is the symbol telling the computer which operation to perform. When a game is written in machine code it makes everything move much more quickly.

MAINFRAME COMPUTER The jargon word used to describe a very large computer.

MICROCOMPUTER A tiny computer (as the name suggests) consisting of hardware and software. The main processing blocks are made of semiconductor integrated circuits.

MICROPROCESSOR Another name for a chip.

NUMBER CRUNCHING The operation in computing which carries out the arithmetic and logical processes which information has to go through.

PEEK A statement used in Basic which allows you to read the contents of a specified memory address.

PERIPHERAL INTERFACE ADAPTOR (P.I.A.) An adaptor which is incorporated in the chip and makes peripheral equipment interfacing easier.

PERIPHERALS Equipment which is used with a computer, e.g. printers V.D.U.s and disc drives.

POKE An instruction used in most versions of Basic allowing you to store integers in a specific place in memory.

R.A.M. (Random Access Memory) This is a memory chip which you can load programs and data to and from.

RANDOM NUMBER A number selected at random from an ordered set of numbers.

R.O.M. (Read Only Memory) A memory chip which can only be read from and not written into.

ROUTINE A set of coded computer instructions used for a particular function in a program.

SOFTWARE Another name for computer programs. It can also refer to computer documentation.

STATEMENT An instruction in a computer program.

STRING A connected sequence of characters, words or other elements usually symbolised with the (dollar) sign.

SUBROUTINE A computer program routine that is translated separately.

SYNTAX The name used to refer to sentence structure rules of a programming language.

USER PORT The entry channel to which a data set (set of similar data) is attached.

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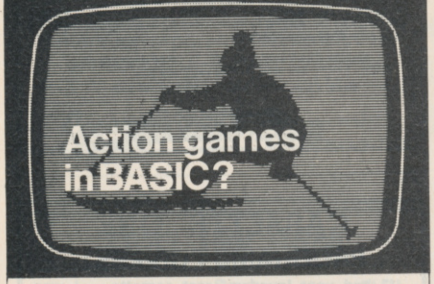

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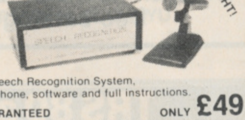

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ACORN ATOM Cambridge based Acorn Computers manufactures the Atom machine which has a memory capacity of 2K, but it can be upgraded to 12K.

It must be plugged into a television and is available in either kit form or ready built. As a kit it costs £120 for the 2K computer or £150 for the finished product. For a more powerful system, 12K, the price stands at £220 (in kit) and £250 completed.

Acorn also makes the Systems 1, 2, and 3 which cost between £69 and £750.

APPLE The Apple has a solid software base for both business and entertainment applications. The machine comes with a memory capacity ranging from 8-48K. You can buy joysticks and paddles to plug in for use with computer games. Colour graphics can be used with a colour television.

The 48K machine costs £695 and is obtainable from Apple Computer U.K., formerly Microsense which is based in Hemel Hempstead, Hertfordshire.

ATARI 400/800 Most of the software for the Atari microcomputers are games or educational, with business applications only recently being introduced.

The basic 400 with 16K RAM costs £340 direct from Atari's UK distributors, via London-based Ingersoll Electronics. The 32K version sells for £395. Peripherals for the machines, like disc drive units and cassette recorders can also be obtained from Ingersoll for £325 and £45 respectively. The 800 is expandable to 48K and the 16K machine sells for £645.

BBC COMPUTER The computer adopted by the BBC to sell in conjunction with its forthcoming series is based on the Acorn Proton. The BBC has developed its own Basic to be used on the machine. Minimum memory is 16K RAM, maximum being 32K. Present plans for the machine are dual purpose, both business and games. Optional extras include joysticks, paddles, disc drives and a cassette for tape loading.

Price is put at £235 for the 16K computer and £335 for the 32K version.

DAI This is a personal computer made by Data Applications for both business use and home entertainment. The U.K. system (it is made in Belgium) has 48K RAM as well as full colour and sound commands. Data Applications is based in Cirencester, Gloucestershire. The 48K system now costs £595.

NASCOM There are two Nascoms available at the moment, both can be used for business and games. The Nascom 2 is the more powerful of the two with 8K RAM and with a Basic interpreter.

It can be bought in kit form and off the shelf complete. The kit is £125 for 1K RAM and £140 for the finished 1K product. £225 will secure an 8K kit. Nascoms are available from Warwick-based Lucas Logic.

NEWBRAIN This is a hand-held computer unit which is at the low end of the price bracket. For 2K RAM you pay £159 upwards and it is expandable to 20K of memory. Hobbyists often opt for this machine because of its low cost and it is used for general business and for playing games. An expansion unit is available which supports floppy disc drives, a printer and a visual display unit. It is available from the Grundy Group.

OHIO SCIENTIFIC Ohio Scientific (OSI) makes the Superboard which is aimed at the hobbyist market. Its memory capacity starts at 4K RAM and is expandable to 32K if you buy the add-on board.

Other machines in this family include the Challenger 1 and 4. These are essentially, cased versions of Superboard. The Challenger 4 is the cheapest of these at £575 and includes colour and sound options.

PET Made by Commodore Business Machines, the Pet ranges from 8K RAM to 32K RAM. It is used mostly by small businesses for general applications but has a hefty hobbyist following. It is available from Commodore of Slough at a starting price of £460. Compatible peripherals are available for the Pet, including disc drives, cassettes for loading tapes and printers.

SHARP MZ-80K Popular with both business and home users, the Sharp's memory capacity starts at 16K and has a top limit of 48K. It comes with a monitor and a cassette recorder built onto the keyboard unit. Disk drives are also available. Manchester-based Sharp Electronics have a recommended retail price of £460 for the 48K unit.

SHARP PC-1211 The smallest computer in the Sharp range. Sharp classifies it as a pocket computer and it is programmable in Basic. It also has a cassette interface for loading and costs upwards of £85.

SINCLAIR There are two types of Sinclair's microcomputer available for under £100. Sinclair really brought the microcomputer into the home. The machines are ideal for learning the rudiments of computing but are limiting graphically. The ZX80 has 1K of memory and is expandable up to 8K, but is no longer in production. The ZX81 sells for £49.95 for 1K in kit form or £69.95 ready assembled. The 16K RAM packs cost £49.95.

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SORCERER The Exidy Sorcerer is a home computer with a sizeable games following but it is one of the more expensive of the microcomputers, costing upwards of £749. Memory amount ranges from 48K to 55K and there is a plug-in ROM pack for extra capacity. Disc drives and visual display unit are an additional cost. Sorcerer's can be obtained from a Cornish firm, Liveport of St Ives.

TANDY TRS-80 Tandy's TRS-80 Model 1 is a machine which is often used for games and is well-supplied with software for both entertainment and business applications. Its memory capacity goes from 4K to 16K but there is an expansion unit available upgrading it to 48K if you want the extra memory. The Model 1 is the cheapest of the Tandy range.

The Model 1 costs £459 but comes complete with a monitor to use as a V.D.U. and a cassette. The Model III is an integral unit made up of a keyboard, 12" screen and two slots for 5¼" discs. It costs from £499.

TANDY TRS-80 COLOUR COMPUTER Tandy's latest addition to its range of computers is the Extended Basic Micro Colour Computer, (or TRS-80 Colour Computer for Short). It is available with either 16 or 32K of memory and costs £449.

The actual computer unit consists of a keyboard which can be plugged into any television set. It is aimed at both business and games users and Tandy has bought out a variety of instant loading games program packages for the machine.

Joysticks needed to play some of the games are extra and cost £17.95 a pair. The colour computer can be obtained from Tandy stores nationwide.

TANGERINE Tangerine Computer Systems produce the Microtan 65, a microcomputer for games and personal use, like household accounts. It comes in kit form and is expandable from an initial 1K memory up to 48K of RAM. The Microtan 65 costs £79.35 for the 1K kit, or £90.85 assembled. Tangerine is based in Ely, Cambridgeshire.

TI-99/4A This computer has recently been re-launched by Texas Instruments. It consists of a separate keyboard with graphics facilities in full colour and now plugs in to a U.K. television. Software available for it from Texas Instruments is mostly business and educational but the firm has recently introduced a bundle of games to run on the computer. It has 16K RAM and uses tapes, discs or plug-in games cartridges. You can buy one of these from Bedford-based T.I. for £299 or from your local dealers.

VIC-20 The VIC is the much-publicised baby of the range of microcomputers from Commodore of Slough. At £185 it is one of the cheapest. Deliveries to dealers have just started. The VIC has full colour graphics on a colour T.V. and there are joysticks available. Although Commodore are plugging the business use of the machine it is tipped to be a hot games computer because of its colour graphics and low cost.

VIDEO GENIE The Genie is made by E.A.C.A. and is a popular games machine. It is compatible with the Tandy TRS-80 Model 1. With 16K to 48K RAM there are disc drives available. The basic unit costs from £369 and is available from Lowe Electronics of Matlock in Derbyshire.

GENIE 1 The replacement computer for the Video Genie is now available. The Genie 1, is an upgraded version of the Video Genie and has full upper and lower case, a machine language monitor, additional Basic, has a sound unit and is cassette based. It is being aimed at the serious hobbyist market and costs £229. A disc version is available, called the Genie II and sells for £310 for the unit, £199 for the expansion box needed, and £225 for each disc drive.

U.K.101 This machine comes in either kit form or ready built with memory capacity of 4K to 40K (with an expansion board). It contains television and cassette interfaces so you don't need a V.D.U. The U.K.101 is a popular computer for playing games and there is a lot of software around for it. The kit costs £149 for 4K, ready built it sells for £199.

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TAPE 3: Real Time Startrek (8K), Mastermind (4K), Tank Battle (4K), Surround (4K), Integration (8K), Biorhythm (4K), Asteroid Shoot (4K), Breakout (4K), Graph Plotter (6K), Graphic Aid (4K), Space War (4K).

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Can you save Middle Earth by rescuing Frodo from Shelob's lair . . . ?

Tolkien's

LORD OF THE RINGS

Lord of the Rings is an entirely new type of game, combining a little of the principle of the 'Adventure' type of game, using words as spells, etc; a little of the 'Quest' principle of moving around the 'rooms'; plus actual graphics showing the various levels, walls, doors, nasties and yourself, Frodo.

The appeal of the game is that it combines skill and chance, so that though developing strategies are important, there is no guarantee that having learnt a strategy it will work twice!

The game is an adaption of Tolkien's book 'The Lord of the Rings', spell words actually being taken from the book as are the characters.

Tolkien enthusiasts will not need convincing of the necessity of saving Middle Earth by escaping from Shelob's Lair; those without this background knowledge will have to play a few games before they become addicted!

In your quest to cast the ring into the Crack of Doom to destroy its evil power you will travel a long and dangerous road. The Lair is on many levels, so you must find the stairs, and beware of the clever nasties, monsters and dwarfs which can detect you from a distance and rush for your gold, which you need to bribe. There are secret tunnels, monsters' tombs and the like.

During your travels you can meet Shelob herself, a Fiery Balrog, Lord of the Nazgul, a Hideous Hill-Troll Chief, a Numakil from the Far Harrad, Hissing Gollum, a Howling Warg, a Barrow-Wight and all those characters of the spell words.

The game, though easy to actually play is complicated in itself with many and varied happenings along the way. But its advantage is that all the time you can see and manipulate yourself in eight different directions.

Peter and Margaret Hutt have developed and produced a most absorbing, and certainly addictive, game . . .

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Or you can battle through the Enchanted Forest to rescue the Princess . . . ?

SWORDS AND SORCERY

Swords and Sorcery sets you out on a quest to rescue the princess held by the wicked Necromancer, taking through many separate adventures and meeting many strange beings on the way to the castle — if you ever get there.

This program is randomly based, so it is not the same old thing time after time.

Off you go through the Old Forest with just a sword and a few provisions, and if you are lucky, assistance from a Dryad as well as counsel from the Great Oracle.

If you meet up with the Nymph, hang on to her, as she is a great guide through the forest as well as helping to fight the dreaded Trolls. But be careful not to upset her as she can easily turn her magical power onto you with a curse.

From time to time you will meet wolves, lizards and snakes. Sometimes you will be bitten but other times you will get away.

Food is most important to you, but you could be lucky in finding some in the forest and also be lucky in finding the magic talisman which will ward off the wicked Necromancer.

The Satyrs are nasties, to be avoided, but the real nasty is the spider, for if you don't run from him — and fast, it's the end for you!

The Dragon is most important, and you can either run or fight. But to get a decent fighting ability rating, to enable you to fight your way back after rescuing the Princess, you have to fight.

Run from the Goblins, or you will be enslaved, to be sold or freed only on payment of a ransom.

More baddies in the form of the Trolls, which come in two versions including the warrior trolls which are your big risk all the time, and an enchanted sword.

All the way through are degrees of your ability, which is either diminished or increased depending on the action you are taking at the time.

Eventually you could make it to the castle and even rescue the princess, but then you've guessed, you have to fight your way back again!

It's a fantastic game, which can be played over and over again, such is its variation, and so do not confuse it with others.

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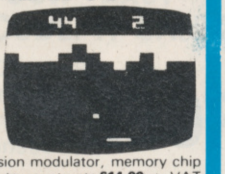

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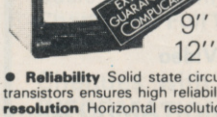

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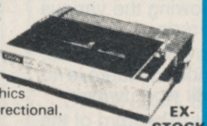

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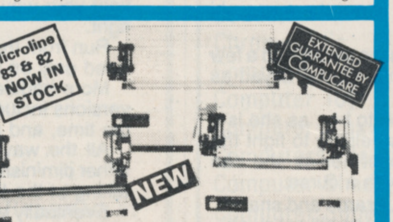

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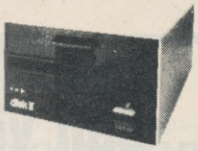

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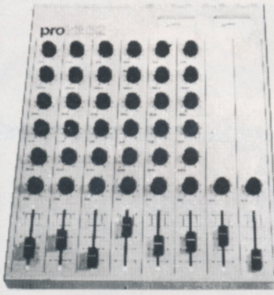

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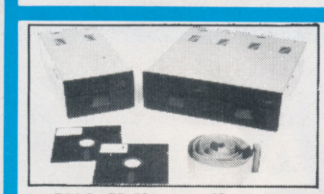

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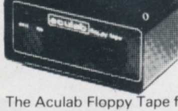

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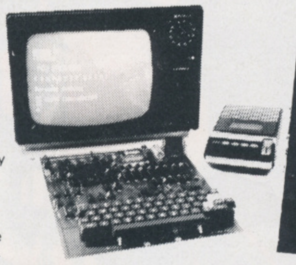

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